M S Swaminathan Research Foundation
Tribal Agrobiodiversity Centre

Hindsight & Forethought

30 years Journey of MSSRF in Odisha

Tribal Agrobiodiversity Centre
M S Swaminathan Research Foundation, Jeypore, Odisha

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SCIENCE FOR SUSTAINABLE DEVELOPMENT

Hindsight & Forethought: 30 years Journey of MSSRF in Odisha

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Honouring the Past, Inspiring the Future

Foreword

Dr. Soumya Swaminathan,
Chairperson, M. S. Swaminathan Research Foundation

Reflecting on this journey of almost 30 years of work in Odisha, I am filled with immense pride and satisfaction on the profound impact the M.S. Swaminathan Research Foundation (MSSRF) has had on the lives of tribal and rural communities in this ecologically rich region. Established in 1998, the Tribal Agro-biodiversity Centre (TAbC) was born out of the recognition that the resilience of our indigenous populations needed to be nurtured through shared knowledge, innovation, and collaboration. From its modest beginnings, TAbC has evolved into a vibrant hub, addressing the complex challenges faced by tribal communities and smallholder farmers, while creating opportunities for sustainable development.

Over the last three decades, our journey has been one of transformative change. By bringing science closer to the communities who depend on the unique biodiversity of Odisha's highlands, we have been able to introduce appropriate technologies that have had a tangible impact on livelihoods, income generation, and resource management. Through Agrobiodiversity Conservation and Farming Systems for Nutrition programmes (FSN), we have not only helped tribal communities to become food and nutrition secure, but also provided tools for sustainable agricultural practices and the enhancement of community resilience.

The success of innovations like System Rice Intensification (SRI) and System Millet Intensification (SMI) speaks to the effectiveness of context-specific solutions that respond to the needs of the people. Through these and other initiatives, we have opened doors to sustainable income for families, empowering them to lead a life of dignity and prosperity.

What makes this 30-year journey particularly remarkable is that it has not been driven by outsiders imposing solutions but by the tribal women, men, and youth who have themselves embraced these innovations and made them their own. They are the true champions of this success story. As we look back on our accomplishments, we are reminded that real, lasting change happens when science listens to people, when technology works for communities, and when solutions are co-created with those who will benefit from them.

However, as we celebrate this milestone, we

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also recognise that the road ahead is fraught with challenges. Hill ecosystems continue to face threats from climate change, over-exploitation, and agrarian crises. These challenges demand greater collective effort, stronger partnerships, and innovative solutions. Yet, I am confident that the solid foundation laid by the TAbC has shown what is possible when science, society, and sustainability come together.

As we reflect on this journey, I extend my heartfelt congratulations to the dedicated team (past and present) at the Tribal Agro-biodiversity Centre, Jeypore, for their unwavering commitment and passion. To the tribal communities who have entrusted us with their knowledge, efforts, and trust – you are the heart of this initiative. I also take this opportunity to thank our partners, funders, and supporters whose belief in our shared vision has enabled us to carry it forward. Let this 30-year milestone not just be a moment of reflection, but the beginning of an even more ambitious chapter. A chapter where our communities continue to thrive, where the hills and the living beings in them are safeguarded, and where livelihoods are strengthened for generations to come. Together, we will continue to work towards a future of prosperity, sustainability, and equity for all.

Dr. Soumya Swaminathan,
Chairperson, M. S. Swaminathan Research Foundation

Preface

Dr. G. N. Hariharan,
Executive Director, Research and Development & Government Affairs, M. S. Swaminathan Research Foundation

It is with great pride and a deep sense of responsibility that I present to you the remarkable journey of the M. S. Swaminathan Research Foundation (MSSRF) in Odisha, an area where our efforts have touched lives, nurtured biodiversity, and contributed to the resilience of the tribal communities. Since the early 1990s, MSSRF has been a beacon of hope for the people of Odisha, particularly in the districts of Koraput and Kendrapara, where we have dedicated ourselves to conserving natural resources, promoting sustainable agriculture, and enhancing the livelihoods of some of the most marginalized communities.

Our Odisha journey began in 1994 with the establishment of a research centre at Cuttack, and soon expanded to coastal Odisha's mangrove ecosystems in Kendrapara. By 1998, we turned our attention to Koraput, a biodiversity hotspot located in the Eastern Ghat Highlands. Koraput, with its paradox of genetic richness and economic poverty, posed unique challenges that inspired us to set up the Tribal Agro-biodiversity Centre (TAbC). It was here that MSSRF focused on not just conserving biodiversity but also empowering local tribal communities through sustainable agricultural practices, equitable access to natural resources, and enhanced food and nutrition security.

Today, MSSRF's presence in Odisha has grown significantly. From the conservation of 356 rice landraces, 72 varieties of millet, and 384 species of medicinal plants, to promoting food-based approaches to tackle nutritional insecurities, our work has touched thousands of lives. We have engaged with over 48,000 tribal families spread across 240 villages and have successfully implemented innovative models like the Bio-happiness initiative, a holistic approach to human development that integrates conservation, cultivation, consumption, and commerce.

Our work focus on creating community-driven solutions–solutions that help conserve genetic diversity while empowering people to build sustainable livelihoods. The support of local women, through entrepreneurship and skill-building, has been one of the highlights of our work. By facilitating the establishment of Self-Help Groups (SHGs) and farmers' producer organizations (FPOs), we have enabled these communities to manage natural and biological resources efficiently and gain access to better markets.

The impact of our work in Odisha is not just limited to the conservation of biodiversity but extends to enhancing food security, promoting water conservation, and improving tribal health resilience. Our collective efforts have earned national and international recognitions, including the Equator Initiative Award, Genome Saviour Award, the Krishi Bisharad Sanman, and the Padma Shri for Kamala Pujari, a tribal

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leader whose leadership in biodiversity conservation was celebrated by the Government of India. These accolades are a testament to the tireless dedication of the tribal communities, MSSRF staff, and our partners who have worked together to bring positive change.

At MSSRF, we firmly believe that environmental sustainability and poverty reduction are inseparable. The Foundation's work in Odisha has demonstrated that by conserving biodiversity, promoting sustainable agricultural practices, and empowering marginalized communities, we can build a more equitable future for all. Our mission is to continue working with the people of Odisha, helping them achieve freedom from hunger, undernutrition, and poverty.

It is my privilege to share with you the incredible progress we have made over the past three decades in Odisha. As we continue to grow and expand our initiatives, we remain committed to creating models of sustainable development that can be replicated not only in Odisha but across the country and beyond.

Dr. G. N. Hariharan,
Executive Director, Research and Development & Government Affairs, M. S. Swaminathan Research Foundation

Preface

Dr. R. Rengalakshmi,
Executive Director, Area Operations,
M. S. Swaminathan Research Foundation

As we celebrate the 30th anniversary of the M. S. Swaminathan Research Foundation's (MSSRF) contributions in Odisha, we reflect our the remarkable journey that has brought us to this significant milestone. Our work in the state, particularly in the hilly agro-ecosystem has yielded invaluable lessons in concurrently building long-term resilience among marginalized farming communities especially tribal households and natural resource management.

The core of our approach has been rooted in empowering local communities, especially tribal and rural women and men in managing the natural resources sustainably. This vision, which has guided us since the establishment of the Tribal Agro-biodiversity Centre (TAbC) in 1998, has led to transformative outcomes of both ecological enhancement and the socio-economic upliftment of tribal communities.

Over the past three decades, MSSRF has made significant strides in promoting agro-biodiversity conservation, improving agricultural productivity, enhancing nutrition and building the resilience of on-farm livelihoods. The evidence from the field reflects how empowering communities with the right knowledge, tools, and support systems can create a self-sustaining and inclusive model for sustainable development. At the heart of these efforts has been the community-driven, holistic approach that encompasses conservation, cultivation, consumption and commerce, a C4 model of agro-biodiversity management.

As we celebrate our achievements, we also acknowledge the growing challenges posed by climate change and anthropogenic issues. The adverse impacts are increasingly apparent on the agroecosystems, agricultural productivity, and the livelihoods of tribal households. In response to these challenges, there is an urgent need for continuing translational research, innovative solutions, and practical actions on the ground. This is particularly critical in regions like the Koraput district, which, despite its rich genetic diversity and cultural wealth, remains one of the most underdeveloped regions of the state. Our work, especially in the areas of agro-biodiversity conservation, sustainable agriculture, and community empowerment, has made significant strides in mitigating some of the adverse impacts of climate change. Yet, the road ahead requires ongoing commitment, collaboration, and innovation in intensifying our efforts to integrate climate resilience into every facet of our work.

The results of our initiatives at the TAbC in Jeypore, along with the dedication of our team of scientists, development professionals, and local communities are instrumental in transforming lives and livelihoods. Our collaborations with the government, research organizations, and policymakers have made a meaningful difference, enabling us to reach more than 48,000 people across over 240 villages in Odisha. In the coming years, we remain steadfast in our mission to build stronger, more

The results of our initiatives at the TAbC in Jeypore, along with the dedication of our team of scientists, development professionals, and local communities are instrumental in transforming lives and livelihoods.

resilient communities capable of managing their natural resources sustainably.

On this occasion, I extend my heartfelt gratitude to all our partners, the communities, government agencies, research institutions and development organizations, whose unwavering support has made this journey possible. The success of our initiatives over the last three decades is a direct reflection of the collective efforts and vision of all the associated partner organizations.

As we move forward, we commit to continuing our work with renewed vigor, focusing on the critical need for climate-smart solutions, sustainable agricultural practices, and enhanced nutrition security for strengthening men and women farmers for an inclusive sustainable and resilient development. This report stands as a testament to the extraordinary dedication and tireless work of the MSSRF team. It is also a tribute to the resilience, wisdom, and spirit of the tribal communities of Odisha, whose contributions to agro-biodiversity conservation and sustainable development continue to inspire us all.

We look forward to the future with hope and determination, confident that, together, we can build a sustainable, bio-diverse, and climate-resilient future for Odisha's communities.

Dr. R. Rengalakshmi,
Executive Director, Area Operations,
M. S. Swaminathan Research Foundation

Preface

Dr. E. D. Israel Oliver King,
Director, Biodiversity, M.S. Swaminathan Research Foundation

As the Director of Biodiversity programme at the M.S. Swaminathan Research Foundation (MSSRF), it is both an honor and a privilege to share with you the journey of MSSRF's transformative work in the state of Odisha. Our partnership with local communities has spanned over three decades, and the impact of this collaboration in enhancing biodiversity conservation, improving sustainable agriculture, and addressing the socio-economic challenges faced by tribal populations is a testament to the resilience and commitment of the communities we serve for.

Our presence in Odisha began in 1994, with the establishment of our first centre in Cuttack. From the very beginning, the Foundation was focusing on conserving the rich biodiversity of the state, starting with the critical mangrove ecosystems along the coastal belt and later expanding to the Eastern Ghat Highlands in the Koraput region. The district of Koraput, known for its immense ecological wealth, also faces the stark paradox of economic deprivation. It is here, in the heart of this biodiversity hotspot, that we established the Tribal Agro-biodiversity Centre (TAbC) in 1998. Our vision was clear–to serve as a Centre of Excellence dedicated to the conservation of genetic resources, the promotion of sustainable livelihoods, and the enhancement of food and nutrition security for tribal communities.

The journey since then has been a remarkable one. With a strong emphasis on community-driven models, MSSRF has played a pivotal role in the conservation of agricultural biodiversity, such as the revival of rice and millet landraces, the establishment of community-managed seed banks, and field-tested nutrition-sensitive agriculture. Through initiatives like the Farming Systems for Nutrition (FSN), we have not only focused on enhancing the yield of food crops but have also taken a holistic approach to nutrition, integrating a diverse range of crops, trees, livestock, and fish to enhance the access to dietary diversity of rural households.

In addition to these efforts, MSSRF has been deeply involved in building the capacities of tribal and rural communities in the Koraput region, recognized as a Globally Important Agricultural Heritage System (GIAHS). Our programs have centered on enhancing awareness and implementation of key biodiversity policies, including the Biodiversity Act, the Protection of Plant Variety and Farmers' Rights Act, the Food Security Act, and the Forest Dwellers Act. By working closely with local communities, we aim to ensure that these policies are effectively leveraged to secure the rights of indigenous farmers, protect traditional knowledge systems, and strengthen community-led conservation initiatives.

Our efforts extend beyond agriculture into areas of water security, tribal health resilience, and gender empowerment. By establishing self-help groups (SHGs) and farmers' producer organizations (FPOs), MSSRF has facilitated income-generating

Our work has been recognized globally, and the tribal communities in Koraput have garnered accolades for their role in preserving traditional knowledge and biodiversity.

opportunities for thousands of families, particularly women, who are at the heart of our interventions. Our work has been recognized globally, and the tribal communities in Koraput have garnered accolades for their role in preserving traditional knowledge and biodiversity.

As we celebrate 30 years of impactful work in Odisha, our mission remains unwavering–to empower local communities to achieve biodiversity conservation and socio-economic development in tandem, ensuring that future generations continue to thrive in harmony with their environment.
We are proud of the milestones achieved thus far, but we are equally committed to the work ahead, for the path to sustainability and equitable development is a continuous journey.
This document is a reflection of the significant strides made by MSSRF in Odisha. We hope it serves as a source of inspiration for other regions, communities, and stakeholders striving for a sustainable and inclusive future. Together, we can build a world where biodiversity is safeguarded, livelihoods are strengthened, and nutrition security is ensured for all.

Dr. E. D. Israel Oliver King,
Director, Biodiversity, M.S. Swaminathan Research Foundation

Gratitude Note

Mr. Prashant Parida,
Director, Tribal Agrobiodiversity Centre,
M.S. Swaminathan Research Foundation

As the Director of the Tribal Agrobiodiversity Centre (TABC) at the M.S. Swaminathan Research Foundation (MSSRF), I am privileged to reflect upon the tremendous progress we have made over the past 30 years in fulfilling the visionary legacy of our Founder, Prof. M.S. Swaminathan. His foresight in establishing the TABC to address the pressing challenges faced by tribal communities in Odisha and other regions has shaped the course of our work, contributing to the resilience and well-being of tribal populations through the sustainable management of agrobiodiversity. As we celebrate three decades of meaningful operations, I extend my deepest gratitude to all those who have supported our journey. We are immensely thankful to our donors, including ICEF, SDC, IDRC, IFAD, Govt of Odisha, Gates Foundation, TATA trust, Summit Foundation, DFID, WFP, Bajaj CSR, DST, DBT, MOEFCC, Ministry of Tribal Affairs, World Fish, GIZ, Mitsubishi, ITC, ICAR- NAIP, NASF, IIMR, NASI, IIRR, NALCO, Indo Morocco, OCPF, University of Reading, University of Cambridge, Grant Challenges, India, BIRAC, USAID and many others. Their continuous financial and moral support has been indispensable in enabling the successful implementation of our diverse initiatives aimed at strengthening tribal livelihoods through agrobiodiversity conservation, nutrition security, and sustainable agricultural practices.

We are equally grateful for the visionary leadership of our Chairperson, Dr. Soumya Swaminathan, whose guidance and unwavering support have been central to the growth and success of the TABC. The invaluable contributions of our Executive Directors, Dr. R. Rengalakshmi, Dr. G.N. Hariharan, and Mr. Srini Raman, have been critical in providing timely support and direction, empowering us to execute our programs with precision. Additionally, the leadership and expertise of our Directors and Senior Fellows, such as Dr. E.D. Israel Oliver King, Dr. V.R. Prabavathy and Dr. R. Ramasubramanian, have helped shape our strategic vision and strengthen our impact. I would also like to express my heartfelt appreciation to all the directors and team members–past and present–whose dedication, teamwork, and passion have been integral to our success. The collective efforts of everyone involved have been essential in bringing Prof. Swaminathan's vision to life. Special thanks go to the tribal communities, custodians of biodiversity, women, and children whose unwavering commitment and feedback have been a source of inspiration for us, enabling us to refine our programs to better serve their needs. Our work would not have been possible without the ongoing collaboration with local communities, government agencies, academic institutions, and various partners. These collaborations have been vital in ensuring the sustainability of our interventions, including the documentation and conservation of over 350 rice and 80 millet landraces, promoting Farming Systems for Nutrition (FSN), and empowering tribal women and youth through skill development and livelihood enhancement.

As we move forward into the next chapter of our journey, we remain committed to innovating and empowering tribal communities to build a future that is prosperous, resilient, and environmentally sustainable. We will continue to draw on the lessons of the past 30 years, with renewed vigor and determination to protect our biodiversity, improve livelihoods, and ensure that no community is left behind in the pursuit of sustainable development.

Thank you once again to all our partners, supporters, and the tribal communities we work with. Together, we will continue to build a future where agriculture, nutrition, and biodiversity converge to create lasting, positive change for all.

Mr. Prashant Parida,
Director, Tribal Agrobiodiversity Centre,
M.S. Swaminathan Research Foundation

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Chapter 1: Our Journey

Prof. M. S. Swaminathan, the founder of MSSRF, named the centre as "Tribal Agro-biodiversity Centre."

M. S. Swaminathan Research Foundation started its activities in the state of Odisha during the year 1994 with its centre at Cuttack. In 1996, an office was opened in Kendrapara (Coastal Odisha) to work on the mangrove coastal ecosystems of the state. Eventually, in 1998, MSSRF initiated the work on the natural resources of Jeypore (Eastern Ghat Highlands Zone) in the Koraput district of Odisha. The district is renowned for its ecological wealth and is considered a centre for the secondary origin of rice. However, it also has the dubious distinction of being known for its poverty, hunger, and backwardness, presenting a paradox of genetic prosperity and economic poverty. Prof. M. S. Swaminathan, the founder of MSSRF, named the centre the "Tribal Agro-biodiversity Centre."

In 2005, the Government of Odisha allocated 12 acres of land to the Foundation at Phulbad village, about 5 km from Jeypore town, where the main building, Biju Patnaik Medicinal Plants Garden, and Research Centre is now located.

One of MSSRF's major achievements in the 1990s was the study and conservation of coastal ecosystems, particularly mangrove wetlands. Based on research into vegetation, soil salinity, and other aspects of mangrove habitats, MSSRF took steps to restore degraded wetlands. MSSRF also initiated a community biodiversity programme aimed at rescuing endangered plant species from extinction, identifying microorganisms to serve as bioindicators of ecosystem health, and conserving genetic diversity of

One of MSSRF's major achievements in the 1990s was the study and conservation of coastal ecosystems, particularly mangrove wetlands.

plant species used for food, medicinal, and other applications.

In addition, MSSRF promotes the Biovillage model of sustainable rural development, helping to conserve the natural environment in developing countries while supporting the economic viability of rural communities. MSSRF is playing an important role in finding solutions to global environmental problems.

The work on the Bhitarkanika and Pichavaram Mangrove ecosystems in Odisha and Tamil Nadu, respectively, and the Biovillage programme in Kendrapara led MSSRF to receive the first Blue Planet Award from Asia, conferred by the Asahi Glass Foundation of Japan in 1996.

The work at the Tribal Agro-biodiversity Centre in Jeypore, Odisha, began with a focus on biodiversity conservation, ecosystem maintenance, promoting sustainable agriculture, and enhancing the productivity of agricultural crops for livelihood security.

Tribal Agro-biodiversity Centre (TAbC) in Jeypore, Odisha (1998)

The work at the Tribal Agro-biodiversity Centre in Jeypore, Odisha, began with a focus on biodiversity conservation, ecosystem maintenance, promoting sustainable agriculture, and enhancing the productivity of agricultural crops for livelihood security. The objectives included the documentation, characterisation, and conservation of biodiversity through in-situ and ex-situ conservation, promotion of the people's biodiversity register, and improving socio-economic conditions through sustainable practices.

Specific goals were set to:

- Conserve genetic resources while safeguarding intellectual property rights
- Build skills and knowledge for sustainable agriculture and livelihood security
- Improve production and soil health management in dryland agriculture
- Address food and seed scarcity, while maintaining nutritional security
- Promote off-farm, non-farm, and on-farm activities to increase income for sustainable livelihoods
- Address malnutrition and community health issues

Koraput of Odisha is a tribal district where more than 60% of the total population belongs to scheduled tribes with as many as 52 tribal communities. The most dominant tribes are Bhumia, Gadaba, Paroja and Kandha. The literacy level of the district population is 49 percent as against the state average of 73 per cent (Census 2011). Koraput district enjoys tropical climate characterized by hot summer (20.5oC to 38oC) and cold winter (12oC to 29oC). The majority of the population of Koraput (88%) live in rural areas and the level of rural poverty at 78 per cent is highest in the state. More than 70 per cent of the farmers are small and marginal landholders. The district is disadvantaged by high levels of undernutrition; for e.g. 70 per cent children (0-59 months) and 58 per cent women (15-49 years) are anaemic, 43 per cent children under the age of five are stunted and 34 per cent are underweight as per the National Family Health Survey (NFHS-5 (2019-2021).

While 1745 landraces of rice have been recorded to be available in Jeypore tract, 60 years back, an explorative survey conducted by MSSRF during 1995-96 could locate only 256 landraces in the area. Keeping in view the above scenario of Koraput, Professor M. S. Swaminathan opened a centre in this biodiversity hotspot region.

In 1998, with a vision to be a leading 'Centre of Excellence

and Resource Agency', in the areas of participatory agro-biodiversity conservation, promotion of genetic literacy, climate and nutri-smart agriculture and sustainable Natural Resource Management (NRM) based livelihoods leading to an era of bio-happiness and achieving freedom from endemic and hidden hunger.

The mission of the Centre is to explore and conserve genetic resources related to agrobiodiversity, safeguard heritage sites, tribal culture, promote sustainable livelihood and food and nutrition security of rural community through developing and demonstrating models for replication, leveraging agriculture for nutrition, women empowerment, grassroot Institution building, training and capacity building and awareness creation, value chain development, convergence and policy advocacy.

The Foundation has largely been working in Kundra, Boipariguda and Koraput blocks of Koraput district and expanded to Khairput block of Malkangiri district, Kashipur block of Rayagada district and Chikiti block of Ganjam district across 240 villages, reaching out to about 1,16,436 HHs.

In the past 30 years, MSSRF -TAbC has contributed to conservation of biodiversity and creating an economic stake in conservation through a C4 model of sustainable management of agro-biodiversity involving concurrent attention to Conservation, Cultivation, Consumption and Commerce, development of agri-food value chains, promotion of sustainable livelihoods through community-level interventions; establishment of community- managed Gene, Seed, Grain and Water Banks; leveraging agriculture for nutrition security; building capacity at the grassroot level; and promotion of genetic literacy and documentation of local conservation traditions.

In this Ecologically Fragile Globally Important Agricultural Heritage Region, The TAbC facilitates community-driven programmes in;

- Maintaining the in-situ and on-farm conservation of the genetic materials viz. 256 rice landraces, 48 millet landraces, 16 pulses, 2 oil seeds, 27 vegetables, 12 wild yams, 30 tubers and 384 species of medicinal plants.
- Helping tribal women and men to protect their rights under the provisions of the Protection of Plant Varieties and Farmers' Rights Act (PPV&FRA 2001) and Biodiversity Act (2002).
- Establishing and nurturing community-based organisations viz. self-help groups (SHGs), producer groups, farmers' producer organisations etc. involved in water and other natural resource management, wasteland reclamation, marketing of aromatic rice variety viz. Kalajeera and products of Nutri-millets.
- Promoting Farming Systems for Nutrition (FSN) to tackle the household food and nutrition insecurity. FSN, as a farmer-led strategy is defined by Prof. M. S. Swaminathan as: "The introduction of agricultural remedies to the nutritional maladies prevailing in an area through mainstreaming nutritional criteria in the selection of the components of a farming system involving crops, farm animals and wherever feasible, fish".

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Glimpses of 30 Years of MSSRF Work in Odisha

Glimpses of 30 Years of MSSRF work in Odisha

Chapter 2: Key Milestones

1994

M. S. Swaminathan Research Foundation (MSSRF) started its activities in the state of **Odisha** with its **Centre at Cuttack.**

1996

The Centre at Cuttack was bifurcated into two; one at **Kendrapara (Coastal Odisha)** to work on the mangrove coastal ecosystems of the state and the other one was assigned the work related to the natural resources of **Jeypore (Eastern Ghat Highlands Zone)** in the Koraput district of Odisha.

The work of **Bhitarkanika** and **Pichambaram** Mangrove ecosystems of Odisha and Tamil Nadu respectively and Biovillage programme in **Kendrapara** led MSSRF the recipient of first **Blue Planet Winner** from Asia conferred by Asahi Glass Foundation of Japan.

1998

Establishment of MSSRF Site Office at Jeypore in a rented building. Initial Projects undertaken were: Conservation and Equitable Use of Biodiversity, Supported by: Swiss Agency for Development and Cooperation (SDC) and SUMMIT, Foundation.

2001

First Community Gene-Seed-Grain Bank was established in Koraput region.

2002

Received **First Equator Initiative Community Award** at the World Summit on Sustainable Development (WSSD) in Johannesburg for conservation of biodiversity and reduction of poverty in the equatorial belt.

2003

Panchabati Grama Unnayan Samiti (PGUS) was formed

2004

12-acre land allotted for Jeypore site office by Shri Naveen Patnaik, CM, Govt. of Odisha.

Foundation laid and **Bhumipuja was done** to establish the center of own.

2005

Every Child a Scientist program under Genome Club in Odisha initiated

2006

Village Resource Centre was established at Jeypore Centre in collaboration with ISRO, Bangalore

2007

Dedication of Biju Pattnaik Medicinal Plants Garden and Research Centre and TAbC, MSSRF, Jeypore by Shri Naveen Patnaik, Chief Minister of Odisha in presence of Prof. M S Swaminathan

First Plant Genome Savior Community Award conferred by PPV&FRA, GoI, New Delhi to PGUS for their outstanding service in conserving and making available plant genetic resources for the development of new plant varieties

2009

Conducted the **International training on "Plant Genetic Resources and Seeds and Policy: Strengthening Community Resilience"** at Jeypore Centre in collaboration with Wageningen University, Netherlands

2010

Human Resource Development Centre established, with the support of Mitsubishi- CSR

MoU with Central University, Orissa to establish a school of Biodiversity conservation in collaboration with MSSRF

Second Plant Genome Savior Community Award conferred by PPV&FRA, GoI, New Delhi to PGUS

Received **Rashtriya Jal Puruskar (National Water Award)** for the Bio-industrial Watershed Program supported by Tata Trust by the Ministry of Water Resources, GoI

2011

Opening of IGNOU **Community College** in the Jeypore campus.

Community Centre in Koraput District established and dedicated to public by Prof. M. S. Swaminathan

2012

Koraput was declared as **Globally Important Agricultural Heritage Site** by FAO

Launching of the **Community Hunger Fighters** – trained Community Volunteers to fight malnutrition and hunger in their villages at Koraput.

Kalinga Kalajeera Dhana Utpadak Samabaya Ltd. formed in collaboration with ORMAS

2013

Sixth Agriculture Leadership Award conferred to Mitsubishi Corporation of India for successfully implementing the project for improving livelihood security of the tribal community of Koraput through Jeypore Center of MSSRF

2014

Water and Food Award – a global recognition of MSSRF which was placed second at the global Humanitarian Water and Food Award (WAF) in London for its community managed Bio-industrial Watershed initiative.

2015

PGUS received **Gopabandhu Jyoti Award** for conservation work by Samaja, Odia newspaper.

MSSRF received state level **Agro-biodiversity fair cum exhibition award at OUAT**

2017

MSSRF's Jeypore Center in collaboration with Directorate of Agriculture GoO & RKVY cell, GoI launched **Alternative Seed System Model & Integrated Farming System for Nutrition**

2018

Jagruti Mahasangha at Kundra was established.

Establishment of site office at Ganjam district, Odisha

2019

Mrs Kamala Pujari conferred **Padma Shri Award** in the field of sustainable agriculture and conservation.

Formation of **Bahuda Farmer Producer Company** ltd at Ganjam

Formation of **Kolab Farmer Producer Company** ltd at Koraput

Formation of **Bamandei Producer Company** ltd at Koraput

2020

Established convergence with ORMAS. Sabari Producer Group and three more SHGs were linked with ORMAS and received the working funds of 3 lakhs each.

2021

Initiative on farmer-led extension strategy was undertaken for enhancing farmers' income through millets-based farming system in hilly and tribal areas.

M S Swaminathan Research Foundation (MSSRF) entered into an agreement with Central University of Odisha, Koraput to undertake collaborative research on Biodiversity, Sociology, Anthropology, Journalism and Mass Communication etc.

2022

MSSRF participated in Comprehensive Rice Fallow Management, a flagship programme of Govt. of Odisha in three districts of Odisha one among the CGIAR institutes

2023

Based on the successful implementation of comprehensive project on rice fallow management, Govt. of Odisha extended its support for the implementation in five districts.

Mrs. Haribala Sukia, a millet seed farmer received the Best Millet Farmer Award conferred by IARI, New Delhi

2024

Gupteswar, a reserve forest of Koraput declared as "Biological Heritage Site" by National Biodiversity Board, Govt. of India

Mrs. Raimati Ghiuria, a custodian farmer of millets and rice received honorary doctorate of Science from OUAT, Bhubaneswar conferred by Hon'ble President of India Smt. Draupadi Murmu. She also received the prestigious Amazing India Award conferred by Times Now Network.

2.1 Coverage and Outreach

12 Districts, 63 Blocks	2,837 Villages	1,16,433 Households
5,12,000 Populations	1,458 GRIs / SHGs	31 PBRs, 32 BMCs
3790 Nutrition Gardens	347 Medicinal Plants conserved	350, 83 Paddy Millet landraces conserved

Chapter 3: Key Thematic Areas of Work

Biodiversity Conservation

The biodiversity of the region is rapidly declining due to various factors. In the period from 1955 to 1960, more than 1,780 landraces of rice were documented in the Jeypore tract of Odisha. The Centre has successfully revived 350 landraces of rice, 83 millets, 14 pulses, 47 vegetables, 30 yams and tubers, and 347 species of medicinal plants (109 trees, 91 shrubs, 39 climbers, 102 herbs, and 6 others). These species are conserved in nine ex-situ conservation gardens, and they are used by nine major ethnic groups of the region – Bhatra, Bhumia, Bonda, Gadaba, Gond, Kandha, Koya, Paroja, and Saura – for their primary healthcare needs.

Species are conserved in nine ex-situ conservation gardens, and they are used by nine major ethnic groups of the region – Bhatra, Bhumia, Bonda, Gadaba, Gond, Kandha, Koya, Paroja, and Saura – for their primary healthcare needs

The tribal communities in Koraput have a rich heritage of knowledge regarding medicinal plants and their uses. As part of MSSRF's initiative to recognise farmers' conservation efforts, an application to the Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA) for the registration of 32 landraces as farmers' varieties was facilitated.

Medicinal Plants

Ex-situ conservation gardens of nine tribes maintained by traditional healers at TAbC garden a total of 347 Medicinal Plants consisting of 109 trees, 91 shrubs, 39 climbers, 102 herbs, and 6 others (like orchids, grasses, ferns etc.) used in the traditional healing practices

Sustainable Agriculture

Techniques like modified System of Rice Intensification; System of Millet Intensification; large scale multi-tier vegetable cultivation with pulses with advanced agri-input and pest management, plus Community Seed Bank system ensured increase yield

Alternative Seed Systems

Production & access to quality seeds of indigenous varieties of paddy, finger millet, little millet, pulses and oil seeds through Community Seed Banks (CSBs) & FPOs at affordable price

Water Security

Bio-industrial Watershed model and DST water harvest model fosters a holistic approach that guarantees irrigation enabling cultivation of (BIWS 610 + DST 400 = 1010) acres of fallow Medicinal Plants land for various crops during kharif, rabi, and off-season, also portable safe drinking water in 34 villages

Farming System for Nutrition

The FSN design mainstreams nutritional criteria in the selection of components within farming systems. It integrates nutritious crops, trees, agroforestry, poultry, livestock, and fisheries, specifically tailored to address the location-specific nutrition needs of rural families. The approach also considers gender and age dimensions, as well as promoting nutrition literacy.

TAbC established 3790 Nutri-rich Gardens in 315 villages of Koraput improving dietary diversity.

Using food-based approach, TAbC established 3790 Nutri-rich Gardens in 315 villages of Koraput improving dietary diversity. And to ensure nutrition awareness, 408 community members are engaged through the Community Hunger Fighter initiative

Tribal Livelihoods

TAbC offers a basket of livelihood options with innovative technologies and value-addition activities

The Tribal Agro-biodiversity Centre has provided a range of livelihood options, comprising both on-farm and off-farm enterprises, to optimise time and labour, resulting in increased income. The identification and promotion of these livelihood diversification options were undertaken in consultation with local communities, agribusiness professionals, and based on value chain analysis.

TAbC offers a basket of livelihood options with innovative technologies and value-addition activities related to on-farm and off-farm enterprises, which ensure better time-use plus income, and reduces agri-labour costs for almost 116433 families

Periodic capacity-building programmes are held for women entrepreneurs on post-harvest processing of agricultural produce, value addition, improved animal husbandry, fish farming, and financial management of small businesses. These initiatives are supported by financial and market linkages.

A tissue culture laboratory has been established at the Centre to produce quality mushroom spawn, and the production and supply of bio-inputs such as Trichoderma viride, rhizobium culture, and PSB (phosphate-solubilising bacteria) are also undertaken.

Tribal Health Resilience

Ensuring a sustainable, community centric model for improving the health & well-being of tribal communities in the areas of maternal and child health, infectious diseases, nutrition, disease surveillance, and WASH practices (water, sanitation, and hygiene)

Grassroot Institutions

Ensuring collective action at scale, TAbC formed seven FPOs; 1458 SHGs; 74 producer groups; and eight farmer clubs, etc., facilitating better profits for small famers

Gender and Empowerment

Building entrepreneurial capacity of women to enhance income earning capabilities with post-harvest processing; value-addition; packaging, marketing training; plus management exposure visits

Glimpses of 30 Years of MSSRF Work in Odisha

Glimpses of 30 Years of MSSRF work in Odisha

Chapter 4: Best Practices and Evidences

4.1 Conservation and Sustainable Use of Rice Landraces in the Eastern Ghats of India: The MSSRF Experience

Introduction

India is home to an immense richness of plant and animal genetic resources, owing to its varied geography, diverse ecosystems, and a rich agricultural heritage linked to its ethnic diversity. The country boasts about 46,042 plant species, which account for more than 11% of the world's known flora, placing it tenth globally and fourth in Asia in terms of plant diversity (NBA India). The Indian Gene Centre is recognised as one of the 12 mega-diversity centres in the world.

India's agricultural heritage includes approximately 50,000 rice varieties, more than 1,000 mango varieties, 5,000 varieties of sorghum, and a rich diversity of domesticated livestock and poultry species. The Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources) emphasises the need for the conservation of agrobiodiversity as a basis for global food security, while fostering sustainable utilisation to combat hunger and malnutrition.

The M.S. Swaminathan Research Foundation (MSSRF) has adopted a C4 strategy that concurrently focuses on conservation, cultivation,

consumption, and commerce (. This community-oriented conservation continuum involves three linked strategies: in situ conservation of habitats, in situ on-farm conservation of diverse genetic materials, and ex situ conservation of species with multiple values through botanical and zoological gardens and gene banks While MSSRF pays equal attention to all three strategies, particular emphasis is placed on in situ on-farm conservation, which is dynamic and often neglected in terms of public funding.

Tribal farmers in Odisha, despite the low productivity of their landraces, have maintained this genetic wealth at personal cost. However, poverty and socio-economic constraints increasingly threaten their ability to continue these conservation efforts

59.4%

Rice is a predominant food crop cultivated in Odisha, covers

Rice in Jeypore Tract, Odissa

Rice is the dominant food crop in Odisha, covering approximately 59.4% of the state's cultivated area (Census, 2011). The Jeypore tract of Odisha is recognised as a centre of origin for cultivated rice, as noted by several researchers. In the 1950s, the Central Rice Research Institute collected 1,745 rice accessions and 150 wild rice accessions from the Jeypore tract, demonstrating the rich diversity maintained by tribal communities in this region.

Tribal farmers in the region continue to conserve and cultivate numerous traditional rice varieties suited to various agro-ecological zones–upland, midland, and lowland–while also preserving varieties for cultural and religious purposes However, the introduction of high-yielding varieties (HYVs) has led to a decline in the area under traditional rice cultivation In 1970, government agencies introduced HYVs in the Jeypore tract, and by 1990-91, 52.9% of the region's rice area was under HYVs, which increased to 85.75% by 2005-06 This rapid shift has caused a significant erosion of rice genetic diversity, especially in the centre of origin, necessitating urgent conservation efforts.

MSSRF initiated its rice landrace conservation programme in Jeypore by surveying the region to assess the status of local landraces. This survey documented 400 rice varieties once cultivated by local communities However, the explorations in 1995-96 and 1998 resulted in the collection of only 256 and 108 rice landraces, respectively, highlighting the extent of genetic erosion.

Ex Situ Conservation

MSSRF adopted a combination of ex situ and in situ conservation strategies for preserving rice landraces. Gene exploration trips conducted in various tribal villages of the Koraput region collected over 100 rice varieties, documenting key traits such as habitat (upland, midland, or lowland), duration of the crop, and socio-cultural values. Traditional knowledge associated with each variety was also recorded. The collected varieties are stored in gene banks for ex situ conservation.

In Situ On-Farm Conservation

Formation of Rice Clusters

One of the key strategies in the insitu conservation effort was the creation of rice clusters. These clusters, based on traditional knowledge, helped identify and conserve 123 rice landraces across three clusters covering 25 villages. Farmers selected the best varieties suited to their agro-ecological conditions through participatory processes

Participatory Conservation, Research, and Enhancement

MSSRF initiated Participatory Plant Breeding (PPB) to improve yields of traditional rice varieties through agronomic interventions such as seed production, spacing, application of farmyard manure, and other standardised practices. PPB promoted specialty rice varieties with high economic potential, such as Kaalajeera and Machkanta, which were preferred by farmers for their unique traits. The process resulted in consistent yield increases for these varieties providing an incentive for farmers to continue cultivating landraces.

Access to Quality Seeds via Gene-Seed-Grain Banks

The Gene-Seed-Grain Bank model proved essential in providing farmers with quality seeds for rice cultivation. The banks, operated under the supervision of MSSRF scientists, helped ensure sustainable seed supply and enhanced yields. A modified method of rice cultivation was developed, including 19 modules for improved agronomic practices, resulting in yield increases of 30-70% compared to conventional methods.

Protection of Farmers' Rights and Recognition of Conservation Efforts

MSSRF has supported the registration of five rice varieties under the Protection of Plant Varieties and Farmers' Rights Act (PPVFR), including Machkanta, Kalajeera, Haladichudi, Gathia, and Umeriachudi. These registrations have helped protect the intellectual property rights of tribal farmers. The conservation efforts of the tribal communities in Jeypore received national and international recognition, including the Equator Initiative Award (2022), the Genome Saviour Award (2006), and the Folk Fair Award (2008).

Marketing Selected Rice Varieties

To enhance the market potential of traditional rice varieties, MSSRF promoted the cultivation of Kalajeera, a lowland scented variety, through participatory yield enhancement and plant breeding. A local cooperative, the Kalinga Kalajeera Rice Growers Cooperative Society (KKRGCS), was established to manage seed distribution, crop monitoring, and marketing. MSSRF also facilitated a market tie-up with the Odisha Rural Marketing and Development Society (ORMAS) to scale up the marketing of Kalajeera.

100

Collected over 100 rice varieties in Koraput region

Table 1. Important rice varieties conserved by the tribal farmers in Jeypore

Sl. No	Name of the varieties	Characters
1.	LAKTIMACHHI	Aromatic, small rounded grain, Compact grains in panicle, Less chaffs
2.	MUKTABALI	Dwarf, more tiller, medium size grain, good yield, tasty
3.	CHEPTIMASURI	Small oval grain, good tiller, tall and strong straw
4.	MAGURA	Red husk, medium size grain, less chaffs, strong straw
5.	SAMUDRABALI	Aroma during cooking, small oval grain, less broken during milling
6.	PATADHAN	Bold grain, more chaffs, strong straw, more tiller
7.	BHATACHUDI	Early matured, bold grain, good tiller, more chaffs in panicle
8.	KALAJEERA	Aroma remains for 1 year without dehusking, less broken during milling, less chaffs, compact grains in panicle, good market potential, best for Kheer, Palau & Biriyani
9.	METRO	Medium size grain, early matured, Provide food during lean period, good straw, more chaffs, Used in first menstrual period of girl
10.	HALADICHUDI	Early matured, good market potential, best for Palau & Biriyani, good yield, disease & pest reistance, popular variety (prefer for Manabasa festival), best for rice handycraft.
11.	DUDHMANI	Small & rounded grains, more grains in panicle, tall, good straw, good yield, aroma comes during cooking
12.	BASUBHOGA	Aromatic, small & slender grain, more chaffs, good tiller, medium height, tasty
13.	KANAKCHUDI	Early mature, dwarf, good tiller, small slender grain, good yield
14.	DESIDUBARAJ	Long slender grain, Aromatic, less grains in panicle, less chaffs, good straw, less broken during milling
15.	BAYAHUNDAR	Small & rounded grains, more grains in panicle, tall, good straw, good yield
16.	TULASHIGANTHI	Medium & rounded grains, more grains in panicle, tall, good straw, tasty
17.	BASTABHOGA	Small bold grain, aroma during cooking, very good straw, tall, better tiller, used in festivals only
18.	KANDULAKATHI	Bold grain, tasty, popular, prepared perched paddy, strong straw for thatching, more tiller, weight grain
19.	BARAMASI	Tall, bold grain, good & Strong straw, better tiller
20.	ALASIKIBA	Long slender grain, best for fried rice, Palau, tasty, tall

Conservation challenges in the prevailing policy environment

Despite MSSRF's efforts, there are significant challenges to the conservation of landraces due to the prevailing policy environment. Technological changes and mechanisation favour modern crop varieties, while agricultural policies prioritise productivity over biodiversity. Subsidised rice availability through the public distribution system (PDS) has also reduced the incentive for farmers to conserve traditional varieties, as PDS rice is often cheaper than the market price of landraces. Furthermore, procurement policies rarely consider the nutritional or culinary value of landraces, posing further threats to their conservation.

Steps Ahead for Conservation of Rice Landraces in Odisha

1. Incentivise the cultivation of rice landraces in the Jeypore tract, the centre of origin.
2. Declare conservation blocks or reserve areas for landraces.
3. Implement a landrace procurement policy with premium pricing.
4. Develop niche markets for landraces.
5. Create a network of custodian farmers and a platform for seed and rice exchange.
6. Promote participatory research to enhance the yield of landraces.
7. Establish community seed systems for the distribution of quality seeds.
8. Encourage participatory seed purification for enhanced seed quality.
9. Document genetic traits of existing varieties.
10. Implement favourable policies for in situ conservation in the centre of origin.

Conclusion

MSSRF has adopted a comprehensive conservation strategy that combines in situ, ex situ, and community-based conservation efforts. Economic incentives for conservation, such as enhancing the productivity of landraces through Participatory Plant Breeding (PPB), Participatory Varietal Selection (PVS), and the System of Rice Intensification (SRI), have played a vital role. Community seed-grain-gene banks have been crucial for providing quality seeds and improving yields for tribal farmers. Recognition of tribal farmers' contributions, including Genome Saviour Awards, has strengthened their commitment to conservation.

To sustain these efforts, it is crucial to create an enabling policy environment that supports the cultivation and marketing of landraces, while persuading local governments to integrate conservation into developmental policies. Creating niche markets and public awareness will be pivotal in ensuring the long-term conservation of rice landraces in Odisha and beyond.

Procurement policies rarely consider the nutritional or culinary value of landraces, posing further threats to their conservation

4.2 Gender Inclusive Extension Approaches in Promoting Millet Production and Consumption in Odisha- MSSRF's Experience

Introduction

Tribal Agro-biodiversity Centre (TAbC), located in the Jeypore tract of Odisha, focuses on promoting the conservation, cultivation, consumption, and commercialisation of landraces of rice, millets, pulses, and vegetables. The Centre's approach aims to foster a sense of ownership within tribal communities regarding the living gene bank and to encourage active participation in all aspects of its work. Key partners include a cadre of master/ lead farmers who have developed a horizontal network for disseminating technologies and innovations.

Promoting millet production is expected to boost the local economy by generating employment opportunities, creating marketable surpluses, and increasing household income

The millet programme, initiated in 2001, initially focused on participatory technology development. Scaling up of the initiative began in 2016 and continues to this day. Since millet is a major crop in tribal areas, the socio-economic development of farming communities depends on the productivity and profitability of millets. Promoting millet production is expected to boost the local economy by generating employment opportunities, creating marketable surpluses, and increasing household income.

The objectives of the millet programme were,

1. To increase millet productivity through the introduction of appropriate farming technologies.
2. To ensure the production of quality seeds via community seed banks or a network of custodian farmers.
3. To promote household consumption of millets to address malnutrition.
4. To conserve landraces of millets.

Issues Addressed

- Declining millet cultivation - The decreasing area under millet cultivation is attributed to the inherent low productivity, lower incomes, and climate-related factors, leading many farmers to abandon millet cultivation.
- Erosion of genetic diversity - Indigenous millet varieties are being lost.
- Non-availability of quality seeds- Quality millet seeds were hard to obtain.
- Malnutrition among tribes - Millets are a low-cost, nutritious food source for ethnic communities. The decline in millet cultivation has negative implications for food and nutrition security.

- Drudgery in cultivation and processing - Women play a key role in millet cultivation and processing. However, the lack of mechanisation increases their labour burden, discouraging farmers from continuing millet cultivation and consumption.

Target Group / Beneficiaries

The primary beneficiaries are smallholder farmers from diverse ethnic tribal groups, with a focus on women farmers and female-headed households.

Funding Mechanisms

Funding has been received from international agencies such as IFAD and IDRC (for conservation and basic research in developing improved practices), as well as from national and state governments, including the Department of Science and Technology, Ministry of Tribal Affairs (Govt. of India), Indian Institute of Millet Research, and the Odisha Millet Mission (for scaling up).

Coordination and Governance Mechanism

The Director of the Centre also serves as the extension programme coordinator. The Centre has trained extension professionals who develop strategies for mobilising farmers, designing and demonstrating experiments, collecting data, and establishing links with other institutions. These professionals also organise meetings with farmers to explain the process and benefits of participatory research.

Trained field staff are responsible for implementing participatory research, mobilising farmers, identifying master farmers, forming farmer research groups, briefing farmers on research designs, establishing and maintaining participatory research plots (e.g., multi-locational varietal trials), collecting feedback and data, facilitating farm days, and enabling the exchange of experiences among farmers.

Master farmers are selected based on their willingness to participate in research, establish research plots, share knowledge with fellow farmers, help others adopt improved practices, produce quality seeds, support community seed banks, and assist field staff with data collection.

Farmer research groups, consisting of farmers from intervention villages, participate in research, share knowledge, observe and compare practices on research plots versus conventional plots, and disseminate skills and technologies within their networks.

Nutrition awareness programmes and exhibitions of value-added products aim to increase household consumption of millets.

Communication and Learning Mechanisms

The Centre follows a collective leadership model for developing communication strategies under the guidance of the Extension Head.

Physical methods

- Millet Awareness Chariot- A mobile vehicle designed to raise awareness about millet cultivation and consumption, featuring posters, songs in tribal dialects, and awareness announcements. This initiative reaches all millet-producing areas.
- Training manuals, hands-on training, and exposure visits.
- Participatory research and demonstration plots.
- Exhibitions of millet varieties and value-added products.
- Community Seed Banks and Farm Schools.
- Farmers and scientists' interaction.

Virtual methods

- Audio-visual aids to raise awareness on millet conservation, cultivation, and consumption.
- Audio messages through telephones.
- Village Resource and Knowledge Centres for disseminating virtual content and facilitating online interaction with experts in a Hub-and-Spokes model.

Methods, Approaches, and Tools

- Participatory research - This method empowers farmers to adopt location-specific improved farming practices. By establishing research plots next to farmers' plots, the Centre allows farmers to observe and adopt best practices.
- Farmer research groups - These groups help farmers learn about scientific agricultural practices and how to conduct their own research to enhance crop productivity.
- Farmer Field Days - These events, which invite farmers to share knowledge and exchange observations, facilitate the adoption of new practices.
- Nutrition awareness programmes and exhibitions of value-added products aim to increase household consumption of millets.

Process Followed in Service Delivery through Collective Action

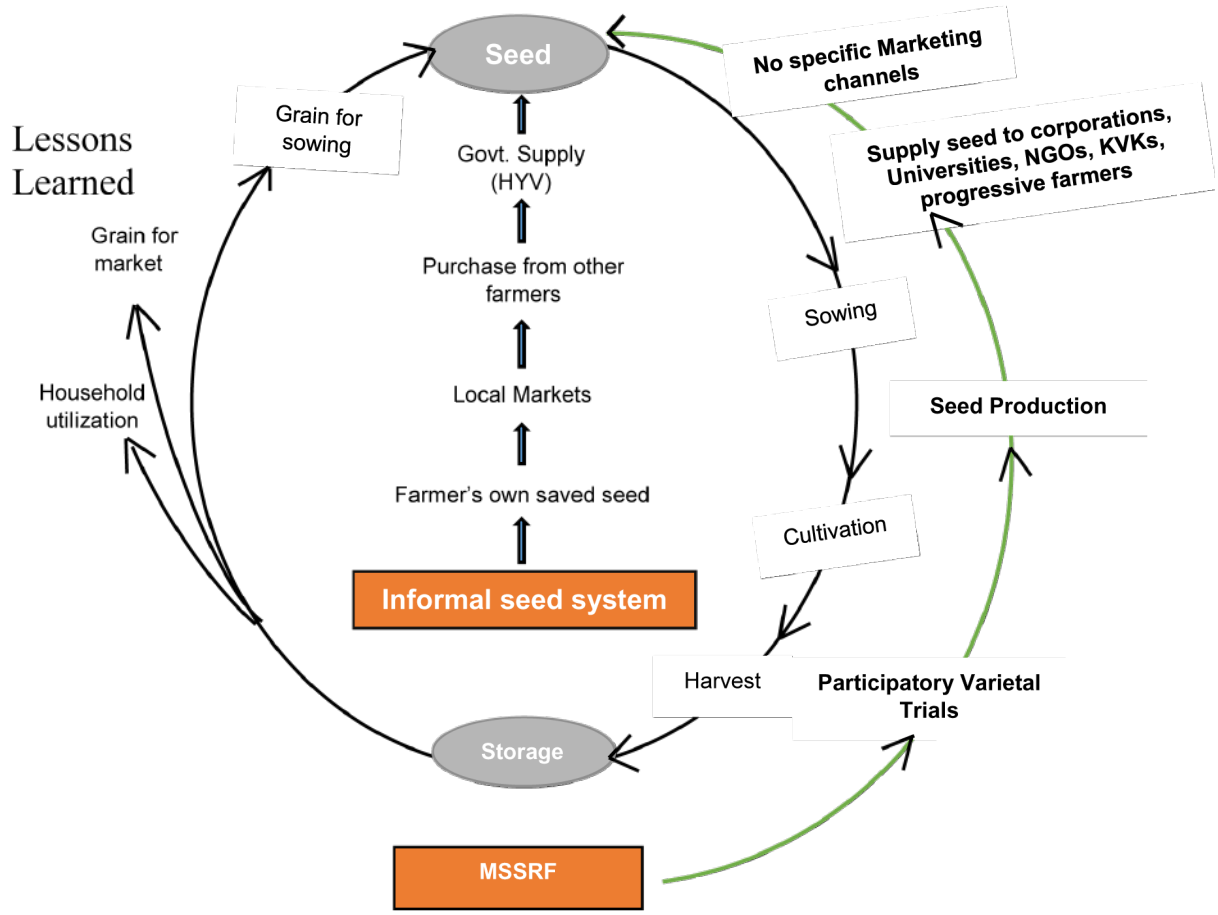
- Village Knowledge Centres were set up to help farmers access

knowledge, agro-advisories, weather updates, and market information.

- Farm schools were established to provide training on improved farming practices.
- Community Seed Banks ensure the production and distribution of quality seeds and strengthen the seed system.
- Mechanisation and Custom Hiring Centres facilitate the availability of farm machines, reducing drudgery and production costs.
- Farmer Producer Organisations (FPOs) were formed as grassroots institutions to ensure participation in millet value chain development. Two FPOs are exclusively run by women, while one includes both men and women.

Key Results (Outcomes and Impact)

- Over 7,500 farm households adopted improved farming practices, covering 3,500 hectares across 590 villages.
- More than 16,500 farmers received training in millet production and value addition over the last decade.
- Over 800 demonstration plots were established with farmers' participation.
- 38 community seed banks were set up to provide quality millet seeds.



Participatory research trials conducted in farmers' fields to develop improved practices

- 181 Custom Hiring Centres were established, providing access to farm machinery like cycle weeders, sickles, winnowers, threshers, sprayers, and seed storage bins.
- Around 2,630 farm machines were distributed to promote mechanisation.
- 101 processing mills were established to reduce the drudgery involved in millet processing.
- Millet productivity increased from 6-10 quintals/ha (pre-intervention) to 12-16 quintals/ha after the intervention.
- Increased millet productivity contributed to higher household consumption, benefiting at least 7,500 farm households directly and 40,000 indirectly.
- Three Farmer Producer Organisations (FPOs) were formed to strengthen farmers in marketing their produce, two of which are women-run.
- An integrated Alternative Seed System Model for millet was developed.

Innovations

The key partnership was with the men and women tribal farmers. Notable innovations include,

- Participatory research trials conducted in farmers' fields to develop improved practices.
- The formation of farmer research groups created a positive impact, increasing adoption rates and facilitating knowledge sharing during farm days and other interactions.
- Custom Hiring Centres enabled farmers to access machinery at minimal cost, reducing drudgery and increasing adoption rates.
- Partnerships with the Indian Institute of Millet Research (IIMR) and the Odisha Millet Mission helped mobilise resources, share experiences, and expand the intervention's coverage.
- Collaboration with farmers' associations, panchayats, NGOs, and the agriculture department ensured outreach to target populations. FPOs, Community Seed Banks, and Custom Hiring Centres further helped extend the programme's reach.

Millets, often neglected by conventional agricultural extension systems, are cultivated in low-income tribal areas using traditional practices. To address this, an integrated extension system was needed, focusing on seed-to-market solutions. Farmers are deeply attached to cultivating their own varieties due to cultural and culinary values.

Key learnings for a successful extension system include,

- Respecting local value systems, cultural preferences, and culinary traditions.
- Participatory assessments of farming systems, local needs, resources, and crop demand.
- Participatory research to address low productivity, build farmer capacity, and demonstrate successful practices.
- User-friendly machinery to reduce the drudgery of women farmers in cultivation and processing.
- Farmer collectivisation for millet value chain participation.
- Promoting the consumption and production of value-added millet products to address malnutrition.
- Investing in local infrastructure such as community seed banks and custom hiring centres, linking them with government schemes and market access.

Challenges faced

- Reaching out to target groups and mobilising them for intervention.
- Apprehension among farmers about adopting new farming practices.
- Sustaining interventions and gaining farmers' trust.
- Mobilising women farmers and encouraging their participation in the value chain.
- Ensuring support from government and R&D partners.

Measures taken to overcome challenges

- Regular visits by the extension team helped build rapport with farmers, involving them in discussions and activities related to millet.
- Multi-locational trials demonstrated improved farming methods, encouraging farmers to adopt new practices.
- Providing farm machinery

4.3 Biju Patnaik Medicinal Plant Garden and Research Centre

The Biju Patnaik Medicinal Plants Garden and Research Centre, an ex-situ conservation garden, was inaugurated in April 2007 in Jeypore, Koraput district

In tribal areas, people rely heavily on traditional healthcare practices, using local flora and fauna for medicinal purposes. They possess unique knowledge about the use of these resources for health and wellness. The ethno-botanical knowledge of tribal communities has gained significant importance, especially in the context of research and the development of new drug formulations for both human and animal health. Tribal healthcare systems also provide low-cost healthcare to rural and tribal populations.

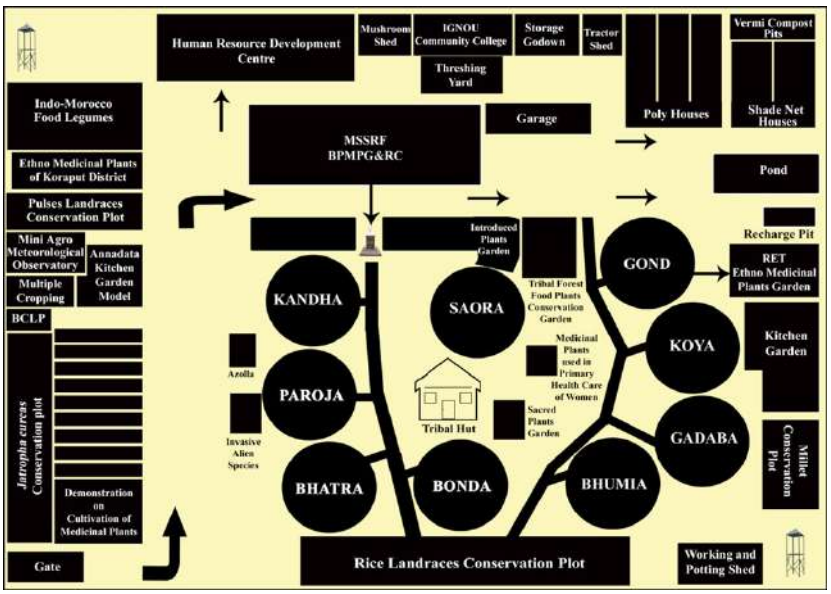
However, these healthcare practices face two major challenges. First, there is the depletion of medicinal plants from their natural sources, including forests and rural landscapes. This is threatening the sustainability of tribal healthcare systems and impacting the rural poor who rely on them. Second, there is a decline in the transmission of traditional healthcare knowledge between generations. The younger generation is increasingly uninterested in maintaining these age-old practices.

As a result, valuable knowledge regarding the medicinal uses of plants is disappearing, further exacerbated by the depletion of medicinal plants and the lack of intergenerational knowledge transfer. Traditional healers and birth attendants from various tribal communities are finding it increasingly difficult to source medicinal plants and continue their practices.

To achieve better health outcomes in tribal and rural areas–such as reducing infant mortality rates, maternal mortality rates, and anaemia among women and adolescent girls–it is essential to create a synergy between traditional and modern healthcare systems. An enabling environment must also be established for traditional healthcare practitioners to continue their practices while ensuring the availability and accessibility of medicinal plants.

In a bid to revive traditional healthcare systems and conserve the region's medicinal plant diversity, the M.S. Swaminathan Research Foundation (MSSRF) established an ethno-botanical garden. The Biju Patnaik Medicinal Plants Garden and Research Centre, an ex-situ conservation garden, was inaugurated in April 2007 in Jeypore, Koraput district. The Government of Odisha generously leased out 12 acres of land for the purpose in 2005, while the Department of Biotechnology (DBT), Government of India, extended financial support for its establishment. The garden was named after Biju Patnaik, the former Chief Minister and architect of modern Odisha.

Medicinal Plant Garden



Objectives of the Garden

The primary objective of the garden is to conserve the genetic diversity of ethno-medicinal plants used by nine major tribal communities in the Koraput region: Bhatra, Bhumia, Bonda, Gadaba, Ganda, Kandha, Koya, Paroja, and Saora. These plants are integral to meeting the primary healthcare needs of these communities. The garden spans 7.2 acres, with each of the nine tribes collecting and planting species from their respective areas. Each plot features over 50-60 plant species, including herbs, shrubs, creepers, climbers, and trees, used for traditional healthcare. The gardens are circular, representing the nine tribes, and the plants are arranged in a natural, forest-like setting.

Medicinal Plant Diversity

The garden conserves the medicinal plant diversity used by the major tribal communities in the region. Research conducted by MSSRF has shown that each community uses medicinal plants in different ways. For instance, the Koya tribe uses 48 plant species for medicinal purposes, while the Kandha tribe uses over 124 species.

A total of 347 medicinal plant species are used in the traditional healthcare systems of these nine tribes. Of these, 109 are tree species, 91 are shrubs, 39 are climbers, 102 are herbs, and 6 are other species (e.g., orchids, grasses, ferns).

Nine Major Tribes and the Number of Medicinal Plants Used by Them

Sl.	Tribe	District	No. of Medicinal plants used for healthcare
1	Bhatra	Nawarangpur	81
2	Bhumia	Koraput	69
3	Bonda	Malkangiri	55
4	Gadaba	Koraput	83
5	Gond	Nawarangpur	67
6	Kandha	Koraput + Rayagada	124
7	Koya	Malkangiri	48
8	Paroja	Koraput	74
9	Saora	Rayagada	59

Conservation and Sustainable Harvesting

Medicinal plants are valuable resources with growing economic potential, particularly in rural India. The traditional healthcare system relies on the conservation of these plants. The medicinal plant-based pharmaceutical sector is expanding, underscoring the economic viability of cultivating and sustainably harvesting medicinal plants. The Biju Patnaik Medicinal Plant Garden and Research Centre focuses on building the capacity of farmers and traditional healers to identify, sustainably harvest, propagate, and cultivate the most in-demand medicinal plants. The Centre also promotes hygienic handling and minimal processing of plants for industrial use.

The Centre also promotes hygienic handling and minimal processing of plants for industrial use.

Awareness and Education

To raise awareness about the importance of conserving medicinal plants, MSSRF has conducted awareness programmes for schoolchildren, youth, healers, and farming families. Visual aids such as audio and video materials are extensively used to help people identify medicinal plants.

Medicinal plant gardens have been established in schools and villages, and plants are also being grown in sacred groves and other culturally significant locations with community participation.

Establishment of 'Home Herbal Gardens'

To further conserve medicinal plants, MSSRF has promoted the establishment of Home Herbal Gardens in tribal villages. These gardens consist of 14 species of medicinal plants used in home remedies. Training has been provided to both women and men in these communities to prepare traditional herbal formulations for primary healthcare. Over 500 Home Herbal Gardens have been established in Koraput district alone. These gardens reduce pressure on local forests and help restrict the unsustainable harvesting of medicinal plants.

Over 500 Home Herbal Gardens have been established in Koraput district alone

List of species selected for home herbal garden

Sl.	Local name	Botanical name	Habit
1	Tulashi	*Occimum sanctum* (L.) Mont.	Herb
2	Brahmi	*Bacopa monnieri* (L.) Pennell	Herb
3	Ayapan	*Eupartium ayyapan*	Herb
4	Guluchi	*Tinospora cordifolia* (Willd.) Hook.f. & Thoms	Climber
5	Thalakudi	*Centella asiatica* (L.) Urban	Herb
6	Patragaja	*Kalanchoe pinnata* (Lam.) Pers	Herb
7	Bhinlimba	*Andrographis paniculata* (Burm.f.) Wall. ex Nees	Herb
8	Pasaruni	*Paederia foetida* L.	Herb
9	Rukuna-Hatapochha	*Coleus aromaticus* Benth.	Herb
10	Brudhadaraka	*Argyreia nervosa* Burm.f.	Climber
11	Pipali	*Piper longum* L.	Herb
12	Podina	*Mentha viridis (spicata)* L.	Herb
13	Basanga	*Justicia adahtoda* L.	Herb
14	Bhrungaraj	*Wedelia chinensis* (Osbeck) Merr	Herb

Multiplication and Distribution of Medicinal Plants

The ethno-botanical garden also focuses on multiplying important medicinal plants and distributing them for cultivation. Based on local importance, demand, and availability, 75 species have been selected for propagation and distribution among interested stakeholders and institutions.

List of Plants propagated at TAbC Campus.

Sl.	Botanical Name	Habit
1.	*Rauvolfia serpentina* (L.) Benth. ex. Kurz.	Shrub
2.	*Datura stramonium* L.	Shrub
3.	*Lawsonia inermis* L.	Shrub
4.	*Bixa orellana* L.	Shrub
5.	*Cissus quadrangula* L.	Climber
6.	*Ocimum canum* Sims.	Herb
7.	*Jasminum arborescens* Roxb.	Shrub
8.	*Jatropha curcus* L.	Shrub
9.	*Plumbago indica* L.	Herb
10.	*Plumbago zeylanica* L.	Herb
11.	*Moringa oleifera* Lam.	Tree
12.	*Clitoria ternatea* L.	Climber
13.	*Vetiveria zizanioides* (L.) Nash	Herb
14.	*Withania somnifera* Dunal	Herb
15.	*Carica papaya* L.	Tree
16.	*Annona squamosa* L.	Tree
17.	*Artemisia nilagirica* (C.B.Cl.) Pampan	Shrub
18.	*Michelia champaca* L.	Tree
19.	*Barringtonia acutangula* (L.) Gaertn.	Tree
20.	*Ficus hispida* L.f.	Tree
21.	*Clerodendrum* indicum (L.) O. Kuntz.	Shrub
22.	*Phyllanthus emblica* L.	Tree
23.	*Mesua ferrea* L.	Tree
24.	*Annona squamosa* L	Tree
25.	*Syzygium cumini* (L.) Skeels	Tree
26.	*Bixa orellana* L.	Shrub
27.	*Mimusops elengi* L.	Tree
28.	*Aloe vera* (L.) Burm .f.	Herb
29.	*Cinnamomum tamala* Nees & Eberm	Tree
30.	*Cinnamomum Verum* Presl.	Tree
31.	*Cascabela theretia* (L.) Lippold	Tree
32.	*Sapindus trifoliata* L.	Tree

33.	*Strychnos nux-vomica* L.	Tree
34.	*Premna latitolia* Roxb.	Shrub
35.	*Asparagus racemosus* Willd.	Climber
36.	*Justicia adhatoda* L.	Shrub
37.	*Bambusa vulgaris* Schard.	Grass
38.	*Oroxylum indicum* (L.) Vent.	Tree
39.	*Plumbago indica* L.	Herb
40.	*Plumbago zeylanica* L.	Herb
41.	*Cassia fistula* L.	Tree
42.	*Commiphora mukul* (Hooker Stocks) Engl.	Tree
43.	*Terminalia chebula* Retz.	Tree
44.	*Murraya paniculata* (L.) Jack	Tree
45.	*Nyctanthes arbor-tristis* L.	Shrub
46.	*Breynia retusa* (Dennst.) Alston	Shrub
47.	*Bombax ceiba* L.	Tree
48.	*Ficus benghalensis* L.	Tree
49.	*Bauhinia vahlii* Wight & Arn.	Climber
50.	*Dalbergia sissoo* Roxb.	Tree
51.	*Streblus taxoides* (Heyne ex Roth) Kurz	Tree
52.	*Mangifera indica* L.	Tree
53.	*Pterocarpus santalinus* L.f.	Tree
54.	*Bridelia retusa* (L.) Spreng	Tree
55.	*Woodfordia fruticosa* (L.) Kurz	Shrub
56.	*Ervatamia divaricata* (L.) Burkill	Shrub
57.	*Helicteres isora* L.	Shrub
58.	*Moringa oleifera* Lam.	Tree
59.	*Polyalthia longifolia* (Som.) Thw.	Tree
60.	*Butea monosperma* (Lam.) Taub.	Tree
61.	*Gmelina arborea* Roxb.	Tree
62.	*Paederia foetida* L.	Climber
63.	*Solanum violaceum* Orteg.	Shrub
64.	*Diospyros malabarica* (Desr.) Kostel	Tree
65.	*Alstonia scholaris* (L.) R. Br.	Tree
66.	*Curcuma caesia*	herb

documenting the knowledge associated with their use.

The garden will serve as a satellite to establish community gardens and home herbal gardens, further facilitating conservation and the commercial use of medicinal plants. There is great potential for cultivating and sustainably harvesting medicinal plants from the wild and forested areas. Moving forward, the garden will focus on building capacity among local communities to harness the future potential of medicinal plants.

By forming networks and collectives of traditional healers, the Centre will empower healers to document their knowledge and protect their intellectual property rights. It is also essential to address conservation challenges, assess the local status of medicinal plants, and evaluate demand from the pharmaceutical sector to develop community-centric business plans that will ensure benefits for healers and cultivators in the future.

The garden will serve as a satellite to establish community gardens and home herbal gardens, further facilitating conservation and the commercial use of medicinal plants.

Formation of the Network of Traditional Healers

MSSRF has facilitated the formation of a network of traditional healers across the region. This network enables the Centre to provide training and capacity-building programmes for healers on identifying medicinal plants, plant propagation, cultivation, sustainable harvesting, and primary processing. The network also facilitates the transfer of knowledge between generations. In many instances, tribal healers have come forward to help prepare people's biodiversity registers and document ethno-healthcare practices. The Centre also maintains a registry of traditional healers.

Conclusion and Way Forward

The establishment of the Biju Patnaik Medicinal Plant Garden is a unique initiative for the conservation of medicinal plants and the preservation of the rich curative traditions of tribal communities in the Eastern Ghats. The garden not only showcases the diversity of medicinal plants in the region but also highlights the importance of conserving these resources and

4.4 Village Gene-Seed-Grain Bank- A Community-Led Initiative for the Promotion of On-Farm Conservation

Introduction and Context

The Jeypore tract in southern Odisha is a region marked by hills and forests, predominantly inhabited by tribal communities. Over generations, these communities have conserved and cultivated a diverse array of plant genetic resources. This knowledge includes understanding the suitability of various crops to different land types (upland or lowland) and culinary preferences. However, the genetic diversity in cultivated crops is rapidly depleting, and the lack of quality seeds of traditional landraces is leading to decreased productivity, which in turn exacerbates poverty and malnutrition in the tribal areas.

In 1995-96, scientists from the Central Rice Research Institute (Cuttack) and the National Bureau of Plant Genetic Resources (New Delhi) jointly conducted a field exploration in the Jeypore tract. They collected 318 rice germplasm accessions, including 256 landraces, with characteristics such as drought resistance, flood tolerance, and pest resistance.

Agriculture remains the primary source of livelihood for people in South Odisha. For smallholder tribal farmers, access to quality seed is essential for good crop yields. Traditionally, these farmers rely on seeds from previous harvests, selecting the best plants for reproduction. In case of seed shortages, they often turn to neighbours or kin for help. Historically, these farmers have not relied on formal seed systems due to their inaccessibility, both geographically and economically.

Furthermore, farmers are hesitant to adopt improved varieties, preferring the landraces that are more suited to their land and cultural practices.

While farmer-led seed systems have played a crucial role in maintaining seed diversity, they are increasingly under pressure from factors such as drought, crop failures, poor storage conditions, and poverty. When seed shortages occur, farmers are often forced into exploitative arrangements with landlords, further worsening the cycle of poverty and food insecurity.

This situation highlights the need for a community-led, sustainable seed system to ensure a consistent supply of quality seeds, free from exploitation. In response, the M.S. Swaminathan Research Foundation (MSSRF) established community-managed Gene-Seed-Grain Banks to empower farmers in the production, storage, and distribution of seeds.

For smallholder tribal farmers, access to quality seed is essential for good crop yields

MSSRF's Objectives and Intervention

In 2001, MSSRF initiated the "Community Gene-Seed-Grain Bank" initiative to ensure the availability of quality seeds of local landraces, including paddy, millets, pulses, and vegetables. The initiative prioritises community participation in seed production and maintains ex-situ conservation plots on farmers' fields. A participatory varietal selection programme was also launched to identify the best-performing varieties suited to local conditions and farmer preferences. The key selection criteria are adaptability, preferred traits, and sustainable yields, especially important for poor farmers in genetically rich areas.

To date, 136 landraces of rice (comprising 23 upland varieties, 35 medium land varieties, and 78 lowland varieties) have been conserved. These varieties are cultivated by farmers across 25 villages, and the collected materials are stored in farmers' fields through field gene-seed banks as well as in a central Community Gene-Seed Bank that maintains controlled temperature and humidity conditions for long-term storage.

To date, 136 landraces of rice (comprising 23 upland varieties, 35 medium land varieties, and 78 lowland varieties) have been conserved.

Results and Outcomes – Successes of the Initiative

The Community Gene-Seed-Grain Bank has proven to be an effective, self-reliant food security system, decentralising the production, storage, and management of seeds and food grains. The community has been empowered to set up and manage these banks, where members can borrow seeds or grains when needed and repay in kind, with interest set by the community.

Since its inception, MSSRF has facilitated the establishment of 30 such banks across the Koraput, Kalahandi, and Kandhamal districts of Odisha. These banks provide seeds of various durations and types, including those suited for upland, medium land, and lowland rice cultivation. In addition to rice, the banks also store millets and pulses. The seed banks are integrated with participatory conservation systems, where farmers actively contribute to maintaining seed diversity.

Gene Bank

The germplasm stored in the Gene Bank is collected from various regions and preserved for future use. All varieties are carefully cleaned, labelled, and stored in dry, sealed containers to protect them from pests, moisture, and other harmful conditions. Detailed records of each germplasm are maintained, ensuring that any loss of biodiversity can be mitigated through reproduction in the fields.

Process of Establishing the Community Gene-Seed-Grain Banks

1. Participatory Assessment- Assess the existing and lost diversity of crops in the village.
2. Need Assessment- Understand community preferences regarding crops and varieties.
3. Village Economy Survey- Identify challenges related to food and nutrition security, as well as access to seeds.
4. Awareness Programmes- Raise awareness on conservation, seed systems, and the benefits of quality seeds.
5. Training and Exposure- Facilitate visits to villages with established Community Gene-Seed-Grain Banks.
6. Consensus Building- Develop management protocols for the establishment and functioning of the banks.
7. Formation of Management Committee- Create a committee to oversee operations.
8. Participatory Varietal Selection- Enable farmers to select and produce quality seeds of preferred varieties.
9. Establishment of Conservation Plots- Set up demonstration plots and community conservation areas.
10. Infrastructure Development- Build infrastructure for seed and grain collection, storage, and distribution.
11. Operationalisation- Monitor the collection of seeds and grains to create a sustainable stockpile.
12. Capacity Building- Train the management committee in bank operations and seed conservation practices.

Interventions and Impact

The establishment of these banks has benefited over 1,260 households across 30 villages. Around 80% of the households borrow from the seed banks during the lean months, from June to September. MSSRF's analysis indicates that the seed banks have alleviated the need for families to rely on exploitative moneylenders and have ensured the availability of grain during times of scarcity, including festivals and family events.

Excess grain stock is sold to raise fund for community development projects, such as building roads, drainage systems, and infrastructure for communal use. This approach has helped foster collective action and self-reliance.

Current Challenges and Future Directions

While the Community Gene-Seed-Grain Bank model was highly effective, the government's food subsidy schemes, particularly the Public Distribution System (PDS), have diminished the relevance of grain banks. With rice being available at highly subsidised rates (Rs. 1-2 per kg), many farmers have become dependent on the PDS for food security, reducing their reliance on community grain banks. Consequently, MSSRF has phased out the grain component from the bank model, continuing only with the seed bank.

Despite this, the need for a robust community seed system remains critical. As formal seed systems and high-yielding varieties expand, they threaten the viability of local landraces and undermine the prosperity of community-based seed banks. Moving forward, it is essential to explore partnerships with national institutions for plant genetic resource conservation and create linkages between formal seed systems and community gene-seed banks. An enabling policy environment, along with incentives for collective action and capacity-building for quality seed production, will be key to ensuring the long-term sustainability of these efforts.

As formal seed systems and high-yielding varieties expand, they threaten the viability of local landraces and undermine the prosperity of community-based seed banks.

Case Studies

- Panchabati Gramya Unnayan Samiti (PGUS)- To institutionalise the seed system, PGUS was formed, representing 16 village-level committees. Women make up half of the membership. PGUS provides training in seed conservation and promotes sustainable agriculture practices, ensuring the continuity of Community Gene-Seed-Grain Banks. The community's efforts have been recognised globally, with the tribal communities of Koraput receiving the Equator Initiative Award in 2002 and the Genome Saviour Awards in 2006 and 2011.
- Saga of Millet Queen- Smt. Kamala Pujari, a tribal woman from Koraput, has been a pioneer in conserving local paddy varieties and promoting organic farming. She was instrumental in the establishment of a community seed bank in her village, Patraput, and was awarded the Padma Shri in 2019 for her contribution to sustainable agriculture.

4.5 Leveraging Agriculture for Nutrition in Odisha- MSSRF's Experience

Introduction, context and problems

Despite impressive gain in agricultural production and greater availability of food, a large population in India is suffering from nutritional imbalance. Majority of population in India is still dependent on agriculture for their livelihood and hence growth in agriculture leading to production of nutritive food would help to combat undernutrition. Therefore, investment in agriculture is 'a critically important opportunity for reducing malnutrition' in countries like India. A significant proportion of children below five years in India faces undernutrition which is manifested in terms of higher incidences of underweight, stunting and wasting.

Undernutrition is very high among children belonging to Scheduled Caste (SC) and Scheduled Tribe (ST) communities. The situation of Koraput district in Odisha is even worst where 43 per cent of children under the age of five are stunted, 16 per cent are wasted and 33 per cent are underweight (NFHS 5, 2019-21). The district is characterized by rainfed farming. The district has high level of poverty of 83 per cent as compared to the state average of 47 per cent. According to the recent data, the district is ranked 541 among 599 districts in India on the District Development Index (USIPI 2015).

The major crops in Koraput district are rice, followed by millets and pulses. More than 70 per cent of the farmers are small and marginal landholders with an average landholding of 1.63 hectare and operational holding of 0.6 hectare (GoO, 2011). Irregular and erratic monsoon cycle and lack of irrigation facilities along with resource degradation have affected the traditional crop cycles followed by a large population of resource poor tribal communities. The district has also been experiencing recurrent disasters like drought and flash flood. Improper soil fertility management, imbalanced application of chemical fertilizer, poor quality seeds, unscientific agronomic practices, absence of crop rotation and crop intensification under rainfed agro climatic conditions has limited the productivity of nutritious crop in this region. Limited access to knowledge about improved agronomic practices is a major obstacle to food and nutrition security among the tribal communities.

More than 70 per cent of the farmers are small and marginal landholders with an average landholding of 1.63 hectare and operational holding of 0.6 hectare

Disconnect between Agriculture and Nutrition

While the agriculture sector has the potential to improve nutrition and health outcomes, the disconnect between agriculture and nutrition in the district is as follows:

- Large population dependent on agriculture and high percentage of undernourished population.
- Challenges identified in Agriculture:
  - Neglect of several climate-smart, naturally fortified food crops and animal foods.
  - Use of poor quality seeds and outdated agronomic practices.
  - Lack of technology transfer and poor adoption of mechanisation
  - More focus on mono cropping pattern
  - Less degree of crop diversification and
  - Declining soil fertility
  - Increased drudgery among farm women
  - Climate change

Farming System for Nutrition Approach

to improve the health and nutrition status of small and marginal farming communities by ensuring availability and access to nutrient rich food in a Farming System for Nutrition Model

The concept of 'farming system for nutrition' derived from the hypothesis that -Transformation of food system by ensuring increased availability and access to diversified diet through nutrition-sensitive agriculture is a low-cost strategy for addressing malnutrition at household level.

Keeping this in view, MSSRF undertook a 'research for development' initiative on "Farming System for Nutrition (FSN) in Koraput district, since 2013. The goal of the initiative was to improve the health and nutrition status of small and marginal farming communities by ensuring availability and access to nutrient rich food in a Farming System for Nutrition Model. The interventions included the introduction of location-specific agricultural remedies for nutritional maladies by mainstreaming nutritional criteria in the production system. Such a farming system gives concurrent attention to the production of diverse crops, livestock, poultry and aquaculture that provide income and food for the farm households. Farming System for Nutrition is an approach to enhance agricultural productivity and farm income, which will lead to more diversified and nutritive dietary pattern and better nutritional outcomes.

The interventions were carried out in selected 7 villages in Boipariguda block of Koraput district covering 658 households. The total population of the selected villages was 2,845, of which 42 belonged to scheduled tribe. Detailed survey has been in 2014 to understand the socio-economic profile, pattern of agriculture and nutrition status in the villages through well-structured questionnaires, participatory rural appraisal (PRA) and focus group discussions.

Survey finding on Agriculture - Nutrition disconnect in the intervention villages

Agriculture	Nutrition	Approach
Less productivity of Finger millet	Gap between demand and supply	Improve productivity and area under finger millet
No major kharif pulse crop	Pulse consumption way below the RDI	Option for introducing a kharif pulse crop
Less productivity of rabi pulses		Improve the productivity and area under rabi pulse
Less area under tuber cultivation	Less consumption	Nutrition awareness
	Vitamin A deficiency in (1-5) yr children	Option for introducing bio-fortified tuber crops (Orange flesh sweet potato; rich in Pro-vitamin A)
Cultivation of vegetables limiting to some groups	Consumption below RDI	Nutrition awareness
	Prevalence of anaemia	Introduction of nutrition garden (cultivation of different groups of vegetables)
Livestock used for either cultivation or source of money or for rituals	Consumption of animal protein below RDI	Scope for introducing fishery as an alternative for animal protein source; where water bodies is available (either individual or community level)

On-farm demonstrations with improved varieties of seeds and package of practices were undertaken. Technology platform of local research institutions (e.g. OUAT, CTCRI, ICMR and CRRI) and stakeholder platform of government and civil society organizations have been constituted to leverage knowledge and intervention partnerships.

Farming System for Nutrition (FSN) – Interventions

To achieve three interlinked objectives like (1) increase in farm productivity, (2) farm income and (3) access to nutritious diet at household level – following key interventions were executed at field level in partnership with local community.

i. **Crop Husbandry interventions:** The crop based interventions under FSN focused on crop diversification through varietal substitution and crop intensification. Varietal substitution through introduction of nutrient dense improved varieties of predominant crops (viz. millets and pulses) with improved package of practices focuses on increasing their production and productivity, thereby increasing nutrient availability per farm household; crop intensification through intercropping systems such as maize and pigeon pea, aims at increasing land use efficiency as well as generating higher monetary income.

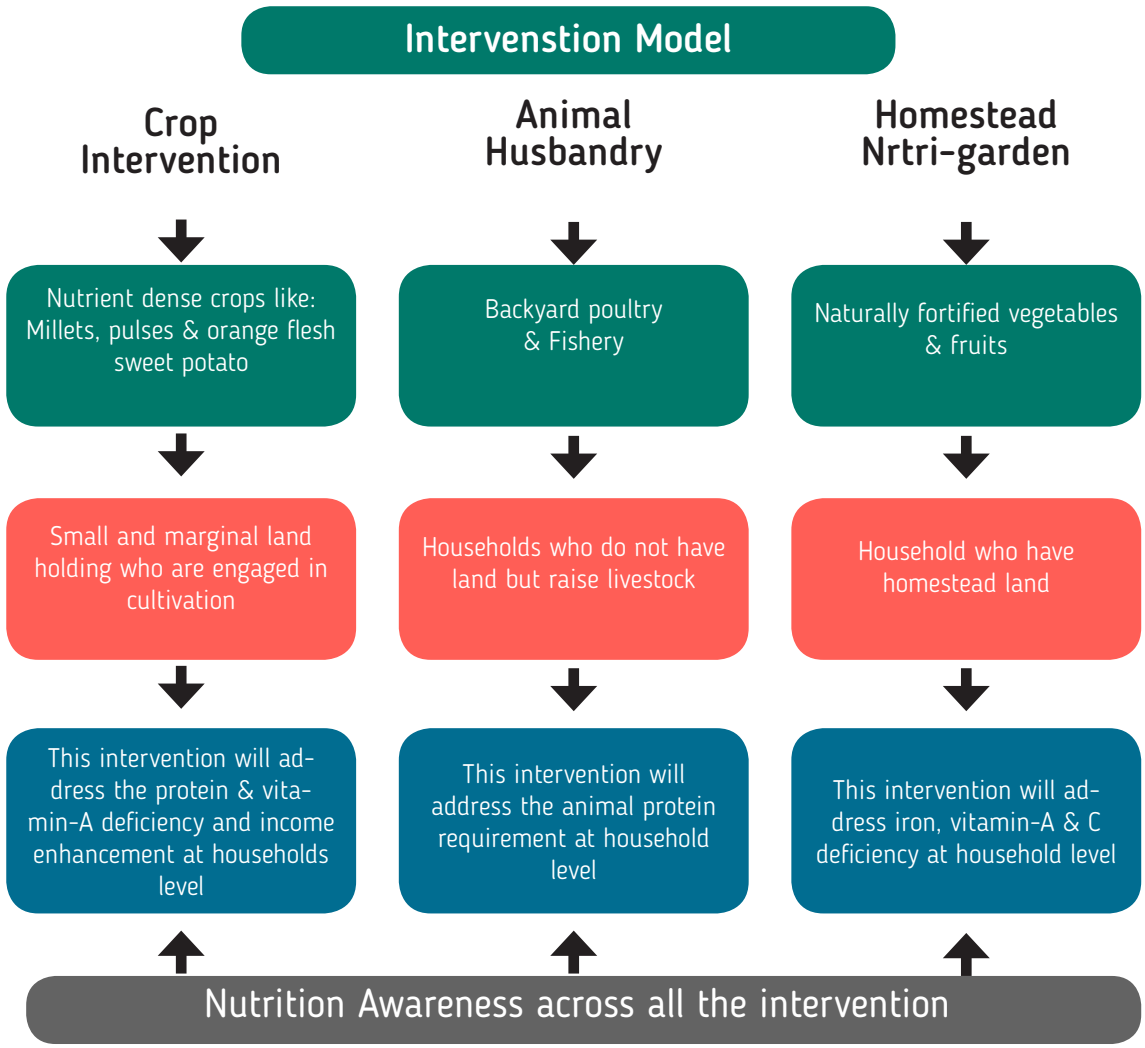
Community hunger fighters were exposed on how to collect the details of schemes/ entitlements and they in turn provide the information to local community as a voluntary service.

ii. **Nutrition garden interventions:** The basic principle of nutrition garden intervention was to create awareness about importance of diversified nutritive diet by promoting the consumption of leafy green, other vegetables, pulses, and fruits and ensuring their availability and access at household level. Quality seeds and planting materials were distributed in accordance with the demand seasonal calendar. Along with leafy greens, other vegetables, pulses, seedlings of fruits like lemon, papaya, drumstick, mango and jackfruit were provided to farm households. Orange fleshed sweet potato promoted to address Vitamin A deficiency.

iii. **Animal Husbandry Interventions:** To ensure the consumption of fish, meat and eggs, we promoted household and community based fish farming based on availability of farm ponds and encouraged landless people to take up backyard poultry.

iv. **Nutrition Awareness Interventions:** Nutrition education and awareness building were integral part of FSN approach. Through series of awareness campaigns and communication materials, we educated local community on leveraging agriculture to improve their nutrition status along with attention to aspects of WASH and health of women and children in particular. This is a continuous effort being undertaken at individual, household and institutional levels. Empowered a cadre of 'Community Hunger Fighters' for spreading the message on nutrition among people.

v. **Sustainability and improved nutritional outcomes:** Measures were taken for ensuring the sustainability of community seed banks and provision of quality seeds of nutritionally dense crops. Empowered local community to access their entitlements in the areas of agriculture, food and nutrition. Community hunger fighters were exposed on how to collect the details of schemes/ entitlements and they in turn provide the information to local community as a voluntary service. Grassroot institutions like SHGs and FPOs were empowered to sustain the production of nutri-dense crops through improved agricultural practices. The enhancement in availability of nutrient dense crops and animal foods coupled with greater nutrition awareness contributing to more intake of nutritionally rich food, and enhanced spending by the household towards balanced diet was expected to lead to greater dietary diversity and improved nutrition outcomes.



Through multiple strategies including sensitization, awareness building, knowledge empowerment, technology dissemination and demonstrating best practices and location specific models, and collection of regular feedback from community and monitoring of production, consumption data and adoption rate, MSSRF implemented the 'Farming System for Nutrition' interventions.

MSSRF's initiatives in Koraput over the years showed evidence of farmers' willingness to take necessary steps to enhance productivity and engage in activities to increase production of nutrient dense crops. With the right kind of support for scale-up, these nutrient-dense crops can help address the problem of undernutrition in the district.

Results/ Impacts FSN interventions

FSN intervention focused on introduction of new crops and enhancing the productivity of nutritionally important crops being cultivated in the intervention villages. For productivity enhancement, we promoted the cultivation of high yielding varieties and improved farming practices.

MSSRF's initiatives in Koraput over the years showed evidence of farmers' willingness to take necessary steps to enhance productivity and engage in activities to increase production of nutrient dense crops.

Comparison of FSN crop interventions

Crop interventions under FSN	Koraput (N=156)	
	Baseline 2014	Endline 2017
Finger Millets*		
% of households cultivating	29	50
Average Production (kg ha^{-1}) ±SD	400±48	2513±28
% of households consuming from home production	21	39
Quantity consumed from home production (g/CU/day)	70.37	80.01
*Red gram (Pigeon pea)		
% of households cultivating		21
Average Production (kg ha^{-1}) ±SD		953±17
% of households consuming from home production		4
Quantity consumed from home production (g/CU/day)		58.85
Green gram		
% of households cultivating	14	37
Average Production (kg ha^{-1}) ±SD	245±82	450±12
% of households consuming from home production	6	30
Quantity consumed from home production (g/CU/day)	49.23	57.72
Black gram		
% of households cultivating	5	29
Average Production (kg ha^{-1}) ±SD	220±64	430±11
% of households consuming from home production	3	13
Quantity consumed from home production (g/CU/day)	39.81	51.79

**Red gram introduced in to the villages based on suitable agro-ecology and nutritive value*

Production Diversity: Cultivation of improved varieties of green gram 'SML 668' and black gram 'TK 94-2' showed 84 and 95 per cent higher yields than the local varieties being cultivated. In the case of finger millet, use of high yielding varieties and adoption of improved practices resulted in a six-fold increase in yield. Maize-pigeon pea intercropping resulted in additional yield of 953 kg ha-1 pigeon pea seeds along with maize from the same patch of land Cultivation of OFSP yielded 6300 kg ha-1 with cultivation by 22 per cent of households in endline. Cultivation of fruits and vegetables become a common practice. Establishment of nutrition gardens resulted in households cultivating six to seven groups of vegetables from 1-2 vegetables during the pre-intervention stage. The diversity and quantity of vegetable production and consumption increased significantly. Regarding aquaculture, 32% of households started aquaculture due to our intervention, with average annual production of 37 kg per 1000 m2 pond area.

Food Consumption Pattern: There observed a shift towards healthy diet in terms of both quantity and diversity. Consumption of leafy greens, other vegetables and fruits increased significantly and reached to the recommended dietary intake. Establishment of nutrition gardens and nutrition awareness programmes have resulted in increased consumption of three critical food groups,

compared to the pre-intervention stage. Average intake of foods entirely from home production was observed to have increased. Six-fold increase in the productivity of millet because of the improved farming practices and adoption of high yielding varieties, also led to an increase in the household consumption of millets. Orange Flesh Sweet Potato has also become part of the diet.

Six-fold increase in the productivity of millet because of the improved farming practices and adoption of high yielding varieties, also led to an increase in the household consumption of millets.

Changes in household dietary intake before and after FSN interventions

Food Groups	Changes in dietary intake	
	Pre-intervention (g/CU/day)	Post-intervention (g/CU/day)
Leafy greens	57	125
Other vegetables	116	245
Fruits	87	124
Finger Millet	70	80
Roots & tubers	89.89	124.33
Pulses & legumes	27.45	44.54
Fish	10.54	28.12
Meat & poultry	15.56	11.52
Orange flesh sweet potato	0	142

Source: Impact Survey

A slight fall in the consumption of meat and poultry products was reported after intervention, At the same time, production and consumption of fish increased due to intervention, which offset the fall in the consumption of meat and poultry. The consumption of pigeon pea was observed after farmers adopted intercropping of pigeon pea with maize in Kharif instead of the conventional sole cropping of maize. Diversified consumption of pulses i.e. consumption of three different types of pulses (pigeon pea, black gram, green gram) by households practicing FSN interventions was also observed.

Frequency of Consumption of major food groups: In terms of frequency of consumption of different food groups, there was a marked increase in "daily" consumption of vegetables from 6 per cent households at baseline to 50 per cent at endline. Similarly, percentage of households consuming pulses and legumes, leafy vegetables, roots and tubers, fruits, and fishes, "twice or thrice a week" increased, suggesting increase in frequency of intake. These changes in food frequency pattern may be attributed both to increased availability as well as greater awareness following the awareness programmes on different aspects of nutrition.

Household Dietary Diversity: Household dietary diversity score (HDDS) was calculated by number of food groups consumed per day. HDDS increased significantly at

p<0.001 from 6.92 to 7.69. Households having HDDS 8 and 9 increased from 19 per cent and 5 per cent respectively at baseline to 29 per cent and 10 per cent respectively at endline, showing that the FSN interventions had improved the household dietary diversity.

The approach can be seen as a subset of the larger canvas of agro-ecology and sustainable food systems, with explicit focus on household nutrition security.

Conclusions:

Farming System for Nutrition is a location-specific, inclusive approach based on resource endowments to address the nutritional needs of households. It is a flexible approach that takes into account the nature of resource endowments available, specificities in environment and nutrition problems, permitting farmers to decide on possible combinations of different components of FSN. The approach can be seen as a subset of the larger canvas of agro-ecology and sustainable food systems, with explicit focus on household nutrition security. The potential of the approach to influence and improve intermediate outcomes such as dietary diversity and the consumption of nutrient-rich foods irrespective of agro-ecological differences as demonstrated by the study, highlight the need for greater support and research in this important area. The results of the study not only add to the evidence for nutrition-sensitive agriculture approach but also contribute to the larger discussion around agro-ecology and food system. The recent experience of the COVID-19 pandemic and breakdown of supply chains following lockdown in India, further reinforces the need for decentralized approaches and local value chains to strengthen community resilience. Practice of the FSN approach by smallholder farmers who constitute a large majority of farmers, can be an important means to move towards Sustainable Development Goal 2 of Zero Hunger.

It has been concluded that enhanced productivity of major crops, production of diverse food groups at household/ community level with a thrust on nutrient-dense crops and animal origin foods along with nutrition education programmes will improve dietary diversity and improved consumption, is the first step towards desired nutritional outcomes

4.6 Improving Dietary Diversity among Vulnerable Population in Odisha

Introduction, context and problems

Food insecurity and malnutrition continue to impose substantial health, economic, and social burden on a large section of people living in developing countries. Lack of resources, religious taboos, educational backwardness and poor socio-economic conditions are all factors that affect food and nutritional security, particularly at the household (HH) level. To ensure food and nutritional security at household level, there is a pressing need to improve diet in terms of quality, quantity and diversity. This in turn requires efforts related to availability as well as economic access to food supply. In order to address the prevailing issues in the areas of food and nutritional security, MSSRF planned a comprehensive intervention aimed to enhance availability and access to diversified food to the vulnerable tribal households. Both food based and nutrition education based activities were planned and carried out for the household food and nutrition security.

To ensure food and nutritional security at household level, there is a pressing need to improve diet in terms of quality, quantity and diversity.

Indicators of Nutritional Status Children and Women in Koraput District

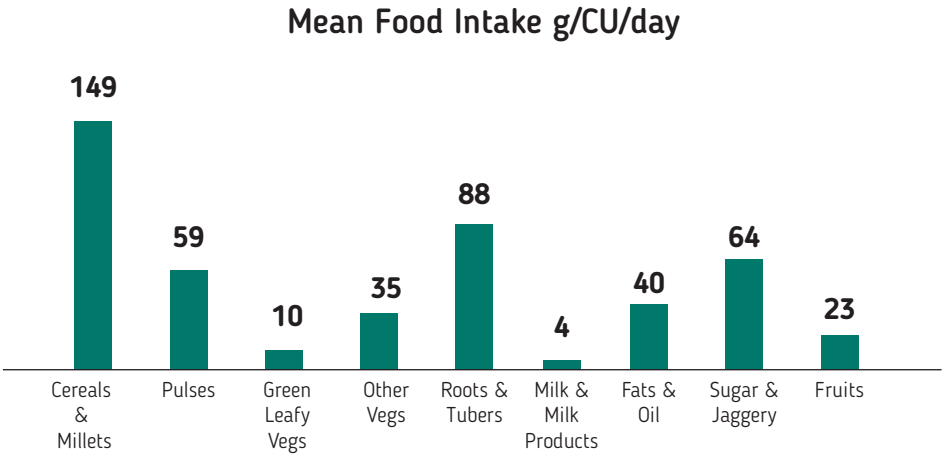
Sl. No.	Indicator	Percentage	Percentage
1	Stunting among children under 5 years	40.3	43.1
2	Wasting among children under 5 years	28.5	15.9
3	Underweight among children under 5 years	44.4	33.5
4	Anaemia among children (6-59 months)	71.4	69.7
5	Women (15-49 years) whose BMI is below normal	34.5	27.2
6	Anaemia among all women (15-49 years)	63.3	58.2
7	Anaemia among non-pregnant women (15-49 years)	63.4	58.2
8	Anaemia among pregnant women (15-49 years)	60.5	59.3
Source:		NFHS, 2015-16	NFHS 2020-21

Intervention area

Koraput is one of the most backward districts in India is also characterized by high level of malnutrition. Tribes form the largest population in the district who are primarily depending on agriculture. National Family Health surveys indicate the poor nutritional status of women and children in the district (see table 1), which on the other hand demands comprehensive nutritional interventions at household and community level.

MSSRF has conducted two studies to understand the food and nutritional status of indigenous people.

Results of the food intake survey in Kundra Block in Koraput district



Source: primary data, MSSRF (unpublished)

State of food and nutrition among indigenous people in Koraput

MSSRF has conducted two studies to understand the food and nutritional status of indigenous people. A study conducted in Kundra Block in 2013 found that people rely largely on cereals while they consume negligible quantity of green leafy vegetables, fruits, milk and milk products. The results of the study are summarized in figure 1.

Another Study conducted in Boipariguda Block of Koraput, in 2014, also revealed that the diet of people largely cereal dominated (624.15 g/CU/day as compared to Recommended Dietary Intake (RDI) 375 g/CU/day) with consumption of all other food groups being less than the recommended level (MSSRF 2014: Baseline Survey, Farming System for Nutrition)

Objectives of the nutrition interventions

In the above context, MSSRF has initiated Nutrition garden programme in order to address malnutrition at household level by ensuring production and consumption of adequate and diverse food groups at household level. Diverse vegetables, leafy greens, pulses, roots & tubers, fruits become part of nutrition garden. Aqua culture and backyard poultry become integral part of nutrition intervention. In order

to increase the access to diverse food groups, it was also essential to increase the yield of cereals like paddy and millets through participatory research. We found that prevailing 'cultural stigma' among different ethnic communities, restrict them consuming milk & milk products and eggs produced at household level. Nutrition education programme hence focused on sensitizing people on the importance of dietary diversity for a healthy life, sanitation, clean drinking water and maintaining personal and environmental hygiene. In order to strengthen nutrition education and to access food & nutritional entitlements, we developed a cadre of community hunger fighters at village level.

In essence, the nutritional interventions strategized to ensure household level production of diversified food, enhancing yield and household income from cereals, educating communities on the importance of dietary diversity, sanitation, clean drinking water and access to various food and nutritional entitlements.

Nutrition Interventions in Koraput

Promotion of Nutrition Gardens

Home-gardening is a time tested local strategy adopted by people in resource poor areas for cultivating two or three species of vegetables, based on the food preference of the household. Even though they provide some form of nutrition, optimal utilization of land to grow potential diverse food groups that can contribute towards the nutritional requirements of the household is not considered.

The nutrition garden on the other hand attempting to optimize utilization of available land for the cultivation of diverse leafy greens, other vegetables, pulses, tubers, and fruits from the nutritional perspectives of the household to address micronutrient (vitamins and minerals) deficiencies, particularly iron and vitamin A. Backyard poultry and aquaculture are also promoted for household consumption. Creating awareness on the importance of consuming vegetables to address micronutrient deficiencies, accompanied with creating awareness on WASH practices and attention to the health of women and children in particular, is an integral component. An integrated approach of nutrition garden can potentially cater the dietary requirements of pregnant women, lactating mothers, pre-school children and adolescent girls.

Improving household dietary diversity is the first step for improving nutrition status of the vulnerable group, so MSSRF focus its intervention on improved dietary diversity through promotion of nutrition garden.

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of nutrition garden. This has to be accompanied by nutrition awareness and be integrated simultaneously with enabling non-farm factors like water, hygiene & sanitation. A starting point for this approach is baseline data on the agro-ecology, socio-economic, agricultural pattern and nutritional status of the community, on the basis of which the interventions can be designed.

Selection of species for nutrition garden

Specific nutrition awareness programmes were conducted for Panchayat Raj members, self-help group of women, members of farmers association, Anganwadi workers and ASHA workers for spreading the message to community.

Nutrition surveys found that leafy greens, other vegetables, pulses, fruits, milk and milk products are consumed far below the recommended dietary intake. Based on these findings, nutrition gardens were established with naturally fortified and biofortified species of various food groups. This included saplings of naturally fortified fruits and tree species like moringa (Moringa oleifera), lemon (Cirtus limon), amla (Emblica officinalis), papaya (Carica papaya), guava (Psidium gujava), and mango (Mangifera indica) Promotion of different groups of vegetables was emphasized for their nutritional importance. Green leafy vegetables are rich in vitamins and minerals, are easy to grow and can be grown almost throughout the year. Other vegetables like beans, tomatoes and okra are rich sources of vitamin C and minerals. Beans are also rich in proteins. Papaya and mangoes are rich in carotene (pro-vitamin A) and vitamin C and guava in vitamin C. Orange flesh sweet potato (OFSP) was introduced and promoted in order to address Vitamin A deficiency in children. Selection of species for nutrition garden is done in a participatory manner in accordance with the specific nutritional demands of the household. Special nutritional requirements of adolescent girls, pregnant women, lactating mothers and children below five years in the family are considered while selecting species in the household nutrition garden

Methods followed to establish garden and nutrition awareness

Through nutrition awareness programmes, house visits and subsequent interaction, we identified and motivated households to establish nutrition gardens. Intensive training and awareness programmes focused on (1) importance of dietary diversity, (2) dietary requirements of adolescent girls, pregnant women, lactating mother, and children below five years, (3) nutritional advantages of different species in the garden, (4) cultivation and maintenance of nutrition gardens, including plant protection, (5) seed collection and storage, and (6) cooking and value addition of various vegetables, fruits, pulses and spices. We also ensured quality seeds, biofertilizers, green nets, pedal pumps for irrigation and protection net for avoiding animal or bird attack. Awareness and Training manuals were prepared and distributed for reaching more households. Specific nutrition awareness programmes were conducted for Panchayat Raj members, self help group of women, members of farmers association, Anganwadi workers and ASHA workers for spreading the message to community. workers for spreading the message to community.

Impacts/ Outcomes of nutrition gardens

i) Diversity in nutrition gardens:

People practiced vegetable garden with scanty species of vegetables, which shows the relatively low

Comparison of number of species of vegetables grown in nutrition gardens before and after intervention

Number of species of vegetables grown in home gardens	***Percentage of households***	
	Pre intervention	Post intervention
One	25	7
Two	32	7
Three	22	7
Four or more	21	79

interest of farm households to cultivate vegetables for household consumption. The intervention packed with awareness programmes, training on cultivation and plant protection, provision of quality seeds and other necessary inputs. Nutrition garden programme received increased adoption rate in the intervention area.

Almost 79% of households cultivated three or less than three species of vegetables before the intervention. Post intervention data, on the other hand shows that households cultivating for or more vegetables increased from 21% to 79%, indicating the significant percentage of adoption of nutrition gardens in Koraput district (Table 2). Further, number of households growing three vegetables in the garden increased from 12% to 33% after intervention. Increased number of species also indicate the increased production of homestead vegetables.

During the study period (2015-17), 43 varieties of plants were observed in the nutrition gardens: they included 17 other vegetables, 8 root and tuber, 6 green leafy vegetables, and 8 fruit/tree species. A maximum of 36 vegetables were grown in winter, 33 in rainy season and 26 in summer season (Table 3).

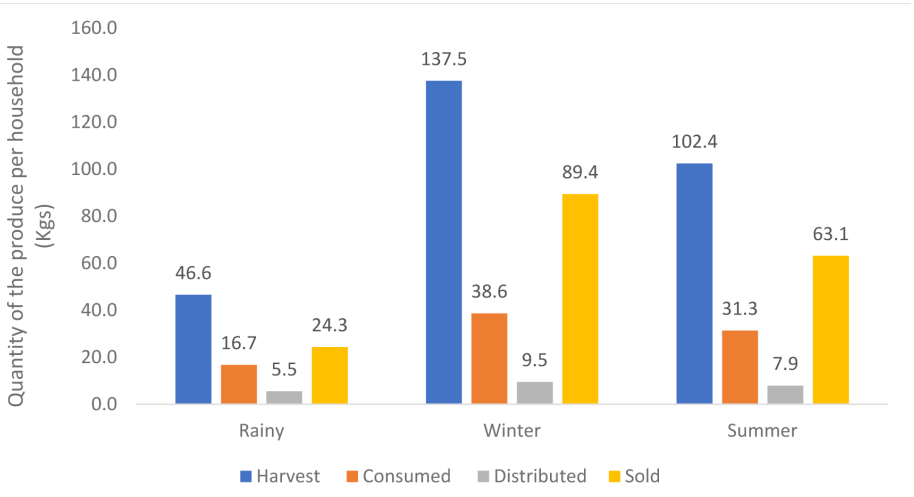
Food group diversity observed in nutrition gardens after the interventions

Food Groups	Seasons		
	Rainy	Winter	Summer
Green leafy vegetables	Amaranthus, Indian spinach, coriander, spinach, leaves of pumpkin, barada, moringa	Amaranthus, Indian spinach, coriander, spinach, leaves of pumpkin, barada, moringa, leaves of cauliflower	Amaranthus, Indian spinach, coriander, spinach, leaves of pumpkin, leaves of cauliflower
Roots & Tubers	Orange flesh sweet potato (OFSP), yam, tapioca, radish	OFSP, colocasia, onion, yam, radish, carrot	Colocasia, onion, yam, potato, radish, carrot
Other Vegetables	Ridge gourd, pumpkin, snake gourd, cow pea, lady's finger, tomato, dolichos bean, french bean, cucumber, bitter gourd, spine gourd, ivy gourd, pointed gourd, brinjal	Ridge gourd, pumpkin, snake gourd, cow pea, lady's finger, tomato, dolichos bean, french bean, cucumber, cluster bean, bitter gourd, spine gourd, ivy gourd, cauliflower, cabbage, spring onion, brinjal	Ridge gourd, pumpkin, cow pea, lady's finger, tomato, dolichos bean, french bean, cluster bean, bitter gourd, spine gourd, ivy gourd, brinjal
Pulses	Pea, pigeon pea	Pea, pigeon pea	Pea
Spices	Chilli	Chilli	Chilli
Fruits	Moringa, papaya, lemon, amla, mango, banana, guava, pomegranate		

ii) Average production and utilization of vegetables across seasons:

Out of 658 households across the seven study villages, 187 households had nutrition gardens during rainy and 215 and 194 households had nutrition gardens during winter, and summer seasons, respectively. During rainy season, out of 187 household nutrition gardens, 50-60 per cent of households had amaranthus and pumpkin. Among leafy vegetables, amaranthus and Indian spinach were preferred among the households irrespective of season. With regard to roots and tubers, around 20 per cent of households cultivated yam, tapioca, colocasia, carrot, radish; OFSP was grown by 3-5 per cent of the households in the nutrition garden as most of the households cultivated it in the main field. Banana, guava, and moringa were the dominant species of tree/fruits.

Production and utilization from nutrition garden per household (2015-17)



A significant portion of vegetables are marketed for earning income after earmarking for household consumption. It is found that vegetables like cabbage, cauliflower, radish, coriander, pumpkin, beans etc are sold in the local market. For the poor families, income takes priority over nutrition and health. There are seasonal variations in production, consumption and marketing of vegetables (Figure 2). Only a small portion of vegetables produced in their nutrition gardens are exchanged with others. Total produce per household was highest in winter as the availability of space in the backyard area was more which otherwise was occupied by maize and pigeon pea during rainy season, leaving little space for growing vegetables.

iii) Impact of nutrition garden on household food consumption and frequency:

The study showed a significant improvement in the consumption quantity of fruits and vegetables ($P < 0.001$). The monthly per capita consumption of green leafy vegetables, other vegetables, roots and tubers and fruits increased from 1554 to 3352g, 3078 to 6568g, 2459 to 2900g, and 2299 to 3334g, respectively. The quantum increase in consumption of roots and tubers and fruits may be attributed to distribution of tree saplings (moringa, papaya, lemon, curry leaves, guava) coupled with nutrition awareness. There was paradigm shift of household food frequency, the consumption of green leafy vegetables and other vegetables increased from once in a week in 2013-14 to daily or twice/thrice in a week in 2016-17. Households consuming green leafy vegetables daily and twice/thrice a week increased from 0 to 4% and 17% to 46% respectively. Other vegetables were consumed by 50% (daily) and 48% (twice/thrice a week) of the household during 2016-17 as against 6% and 76% in 2013-14, respectively. Increased availability and greater understanding of nutrition importance of healthy foods among the household contributed towards all these positive shifts in the food frequency pattern.

Promotion of nutrition gardens has increased availability of and access to different groups of vegetables; most of which are being consumed by the households. Over years, significant increase in the quantity and frequency of consumption of fruits and vegetables and huge demand generation from households suggests a positive trend as well as well acceptance of the approach. The improved dietary diversity will lead to improved nutrition outcomes at household level. It can help in conserving crop diversity including some indigenous species as well as strengthen family relationships and social network through sharing of vegetables between members of the network. It was evident from the study that provision of seeds and technical advice with nutrition awareness increased the production and consumption of both traditional and non-traditional micronutrient rich vegetables. Nutrition gardens are low cost practical ways to increase the availability and access to diverse food groups.

The average intake of micronutrients like calcium, iron, vitamin C and folic acid from fruits and vegetables sourced from nutri-garden increased significantly in Koraput after nutrition garden intervention.

Constraints, and sustainable solutions

- Round the year production of vegetables is still a challenge. During summer, lack of water for irrigation increases the constraints. Similarly, heavy rainfall during monsoon also making vegetable farming a challenge. Low-cost irrigation methods which consume less water and protecting crops from heavy down pour of (untimely) rainfall are possible remedies.
- Sustainable availability of quality seeds is yet another problem faced by the farmers when they rely on improved varieties. Revival of seed system and participatory research for enhancing the productivity of local vegetables can be initiated.
- Even after series of awareness programmes on the importance of nutritious diet, people prefer cereal rich diet, out of convenience, partially because of availability at household level and from PDS. This necessitates integration of diverse food groups in PDS. Community level infrastructure for sustainable production of vegetables, fruits, pulses, tubers may also ensure desired nutritional outcomes.
- Nutrition education needs to be part of curriculum of the students – which will generate awareness about dietary diversity and nutrition among children and parents.
- Refreshment training/ awareness programmes on nutrition are essential for frontline health workers and ICDS staff

4.7 Integrated Approach for the Conservation, Cultivation, and Consumption of Pulses in Odisha: MSSRF's Experience

Introduction

In drought-prone districts like Koraput, pulses such as garden peas, black gram, green gram, pigeon pea, and horse gram are cultivated by farming communities during both the Kharif and Rabi seasons. However, several factors contribute to the low productivity of these legumes, including poor soil fertility, lack of irrigation, insufficient access to quality seeds, inadequate knowledge of improved farming practices, rising production costs, pest and disease outbreaks, and unstable markets. Furthermore, changing climatic conditions pose an additional threat to pulse cultivation.

Pulses are an affordable source of plant-based protein, and traditionally, tribal communities in Odisha have relied on these crops for their nutritional needs. Pulses also offer potential for income generation. In the context of climate change, it is crucial to conserve traditional landraces, as they are genetically diverse, drought-resistant, and less susceptible to pests and diseases. These landraces, in addition to being adapted to local soils and cultivation practices, are rich in nutritional value. To promote pulse cultivation, there is a need for access to quality seeds and higher yields. Improved agronomic practices have been demonstrated through participatory approaches, while farmers have been empowered through training programmes. To support pulse consumption, nutrition education initiatives have been conducted. Additionally, farmers and their collectives have been engaged in the value chain, enabling them to market pulses more effectively.

Early Intervention to Conserve and Cultivate Landraces of Pulses

Due to changes in rainfall patterns, growing pulses successfully during the Kharif season has become challenging. Pulses and groundnut are typically grown using available moisture, with sowing taking place at the end of January or early February, following the rise in winter temperatures. Interventions introduced through the project aimed to grow pulses and groundnut on high, sloping lands during the Kharif season, particularly to address seed requirements for Rabi sowing.

Recognising the importance of conserving local pulse varieties for their nutritional value and resilience, MSSRF initiated the production and collection of seeds of pulse landraces through community seed banks. A total of

In the context of climate change, it is crucial to conserve traditional landraces, as they are genetically diverse, drought-resistant, and less susceptible to pests and diseases.

MSSRF's efforts to equip farmers with the skills to produce quality seeds helped alleviate the scarcity of pulse seeds in the district

16 pulse landraces were distributed across 16 villages for conservation. The initial costs of producing quality seeds were covered by the 'Genome Saviour' award fund, received in recognition of the conservation of plant genetic resources by tribal farmers.

The pulse promotion activities were integrated with the bio-industrial watershed programme to reach a broader base of farmers. Pulses (landraces) were distributed through community seed banks, and their cultivation and consumption were promoted. Based on initial learnings, improved farming technologies were introduced to smallholder farmers to increase the production and productivity of food legumes, thereby strengthening food and nutrition security and boosting farm income. The key activities undertaken to promote pulse cultivation included:

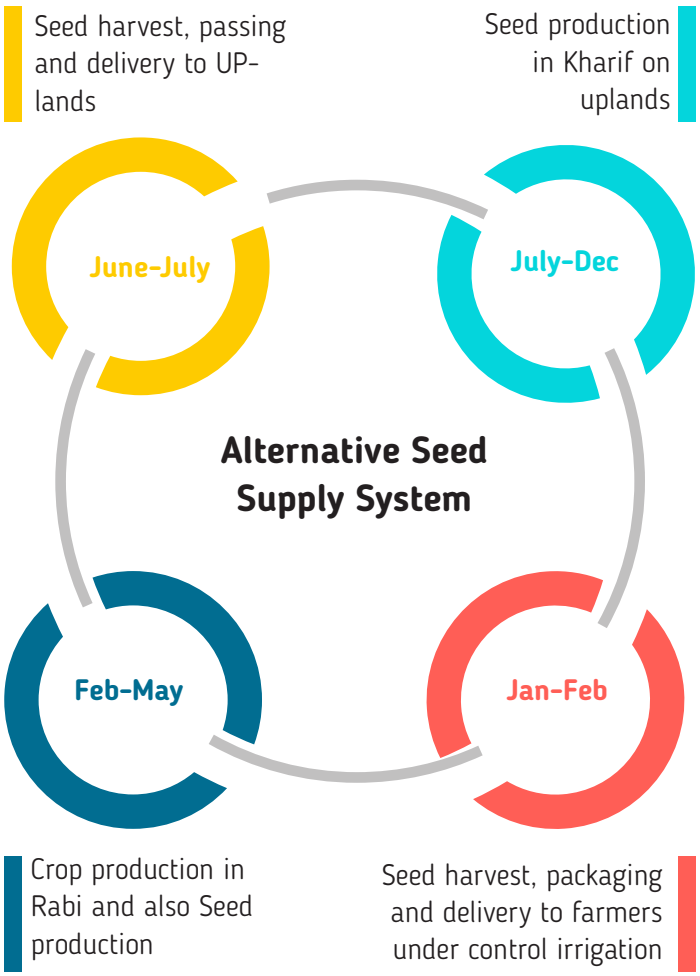
- Documentation of the value chain for targeted food legumes
- Testing and evaluation of improved varieties through an on-farm participatory approach
- Integrated Crop Management (ICM) for pulses and groundnut
- Establishment of alternative seed systems and functional village-level seed delivery systems
- Value addition through post-harvest processing, storage, and labelling
- Capacity building and networking of all stakeholders

Key Outcomes of the Pulse Interventions

Key Outcome 1: Alternate Seed System

To ensure sufficient pulses for household consumption and to increase productivity, MSSRF developed an alternate seed system for pulses. Access to quality pulse seeds had long been a challenge for farmers, but MSSRF addressed this by providing training and capacity building in seed technology. Farmers received hands-on training in quality seed selection, production, and storage. This alternative seed system now ensures farmers' access to high-quality pulse seeds. Farmers engaged in quality seed production are not only able to supply seeds to their own villages but are also selling them to neighbouring areas and to the Odisha State Seed Corporation (OSSC). MSSRF's efforts to equip farmers with the skills to produce quality seeds helped alleviate the scarcity of pulse seeds in the district.

Alternate Seed Supply System for Pulses



Pulse seed production

Years	No. of farmers	Area (Acre)	Production in Qtls.	Quantity of seeds supplied to OSSC (qntls)
2018-19	87	66	186	113
2019-20	160	250	727	545
2020-21	175	150	476	352
2021-22	167	138	568	432
2023-24	185	175	483	340
2024-25	195	200	-	-
TOTAL	969	979	2440	1782

Key Outcome 2: Promotion of Pulses in Odisha

MSSRF has been working with local communities since 2012-13 to promote the cultivation of pulses in Odisha. This work involves mobilising farmers, training them on pulse production, demonstrating innovative farming methods, and introducing post-harvest processing techniques. The focus has been on enhancing pulse productivity through agronomic interventions and quality seed production.

Since 2016-17, MSSRF has been involved in quality seed production for pulses. To scale up pulse promotion activities in Odisha, MSSRF has partnered with the Government of Odisha to utilise rice fallows for pulse cultivation. Working with local communities, MSSRF provides training on various aspects of pulse cultivation, including the scientific application of fertilisers, quality seed production, post-harvest processing, and value addition. The programme currently covers five districts in Odisha.

Since 2016-17, MSSRF has been involved in quality seed production for pulses. To scale up pulse promotion activities in Odisha, MSSRF has partnered with the Government of Odisha to utilise rice fallows for pulse cultivation.

Promotion of pulse production

Years	No. of farmers	Area (Acre)	Production in Qtls.
2012-13	197	337	781.84
2013-14	336	685	1096.80
2014-15	565	535	1470.70
2015-16	664	795	2241.90
2016-17	820	931	2467.15

Scaling up of pulse production in Odisha

Year	Districts	No of farmers	Green gram (ha)	Black gram (ha)	Bengal gram (ha)	Field pea (ha)	Lentil (ha)	Grass pea	Total area covered (ha)
2022-23	Nayagarh	6888	2000						2000
	Malkangiri	1632	1250	210					1460
	Koraput	1334	670	190					860
	Total	9854	3920	400					4320
2023-24	Nayagarh	15524	3500	1000			200		4700
	Malkangiri	6468	4080	1300	470				5850
	Ganjam	19297	7600	550					8150
	Total	41289	15180	2850	470		200		18700
2024-25	Nayagarh	19644	7600	600				300	8500
	Malkangiri	16320	6600	1900					8500
	Gajapati	8996	2500	1550		300	150		4500
	Khorda	24548	11500	3000					14500
	Kandhamal	17389	300	1700		2500			4500
	Total	86897	28500	8750		2800	150	300	40500

Outcome 3: Conservation of Landraces of Pulses

The conservation of landraces is critical, as they possess diverse genetic traits, such as resistance to pests and diseases, medicinal properties, and tolerance to abiotic stresses. These landraces are vital for both dietary and cultural purposes. Many landraces are well-suited to poor soils and variable climatic conditions, and farmers continue to conserve them, even though they yield less than commercial varieties.

MSSRF has been working closely with local communities to conserve and promote landraces of pulses. Farmers have been empowered to produce and maintain quality seeds of these landraces, which are made available through community seed banks.

Diversity in landraces of pulses conserved by farmers

Sl. No	Legume	Landraces	Remarks
1	Green gram	Jhaimuga	Scented, tasty, pest/disease resistant
		Sujata	Scented, tasty, pest disease resistant
		Ikirimuga	Scented, tasty, drought resistant
		Karibar	Scented, tasty
		Desi	Scented, tasty
2	Red gram	Kathikandula,	Scented, tasty, small grain, easy to cook, drought resistant
		Sidikandula,	Preferred by local people for taste and cooking quality
		Kathikandula,	Drought resistant
		Badakandula	Drought resistant
3	Black gram	Lota Biri,	Cultivated on upland, during rainy season
		Buta Biri	Suitable for both upland and lowland
4	Dolichos lablab	Kalasemi,	Climber -Drought resistant, perform well in poor soil
		Mankada Jhata,	Climber - Drought resistant, perform well in poor soil
		Chopa Jhata,	Raw grain used for curry preparation, nutritious
		Butasemi	Shorter plant, large grain
5	Beans	Jhudunga	Used as vegetable in tender form
		Buta Jhudunga	Used as vegetable in tender form
		Dangar-rani	Increased nitrogen fixing in soil, nutritious and tasty
6	Horse gram	Kola kolatha	Black grain, medicinal – kidney stone treatment
		Desi kolatha	Brown in colour, Medicinal – pain relief

Conclusion

Pulses are an essential protein food and an integral part of the diet. However, low yields and inadequate production of pulses limit farm families' ability to meet the recommended dietary intake. To increase productivity, there is a need for the transfer of technology, the production of quality seeds, and better market integration.

To promote pulse cultivation, MSSRF adopted an integrated 4C (Conservation, Cultivation, Consumption, and Commerce) approach, working in close partnership with local communities. Through agronomic interventions, MSSRF aimed to narrow the yield gap between high-yielding and traditional pulse varieties. By transferring seed technology and demonstrating improved farming practices, MSSRF successfully increased yields.

Nutrition education programmes emphasised the importance of incorporating pulses into the diet. The combination of increased household production and nutrition education led to improved dietary outcomes. Additionally, through alternate seed systems and collective efforts, farmers were able to access markets for their pulses.

4.8 Alternate Seed System Models Transforming the Lives of Tribal Farmers in Odisha: A Case Study of a Woman Farmer

rural farmers. To address this, the MSSRF (M. S. Swaminathan Research Foundation) initiated an alternative seed system model in Odisha, aimed at linking tribal farmers with formal seed systems, building their capacity in seed technology, and ensuring their participation in quality seed production in collaboration with formal institutions such as research and development agencies and state seed corporations.

Introduction

Private seed companies and public sector agricultural extension agencies play a crucial role in this system, applying advanced technologies to produce high-yielding seeds

Seeds are a critical input for crop production. Ensuring the availability of quality seeds is vital for the sustainability of farming, improving livelihoods, and ensuring food and nutrition security. Farmers access quality seeds from various sources. In rural tribal areas, many still use their own seeds or exchange seeds with other farmers – a practice known as the informal seed system. The formal seed system, by contrast, focuses on improved varieties and is characterised by a vertically organised production and distribution of certified seeds, under a strict quality control and regulatory regime. Private seed companies and public sector agricultural extension agencies play a crucial role in this system, applying advanced technologies to produce high-yielding seeds.

Tribal farmers in remote areas of India often have limited access to the formal seed system. This results in low agricultural productivity and perpetuates poverty among tribal and

Alternate Seed System interventions at a glance

Alternative Seed-system Model involving tribal farmers as seed producers; Supported by RKVY and Odisha State Agriculture and Farmers' Empowerment Department		
2018 - 19	2019 - 20	2020 - 21
Initiated in Six Villages		
72 farmers participated – 62 ST Farmers and 10 others	122 farmers; (71 tribes and 52 others)	230 farmers (179 tribes, 51 others)
10 women (6 ST and 4 others)	17 women (13 ST and 4 others)	33 women (29 ST and 4 others)
Area under seed production: 75 acres – Finger Millet	Area under seed production: 152 acre – Finger Millet	Area under seed production: 196 acres – Finger Millets
Seeds: (Arjun – Breeder seed/ Foundation seed (OUAT); KMR 204 –Breeder Seed from GKVK)	Seeds: Arjun Foundation Seed KMR-204 VL Mandua 352 (from Odisha State Seed Corporation)	Seeds: KMR 204 – Foundation Seed Arjun Foundation Seed (from Odisha State Seed Corporation)
	Produced 900 quintals of seeds; 452 to Odisha State Seed Corporation; 448 to others (farmers and private agencies)	Produced 1372 quintal seeds and marketed (to Odisha state seed Corporation, private seed companies, NGOs and farmers)

Story of Change: Chita Chendia: A Woman Farmer Transforming Her Village through Seed Technology

The alternative seed system interventions have brought about significant changes in the lives of tribal farmers in Odisha. The introduction of quality millet seeds has helped farmers optimise their upland areas, significantly increasing productivity and profitability. This is exemplified by the case of a tribal woman millet farmer, Chita Chendia, who has motivated farmers in her village to adopt quality seeds and improved farming practices for higher productivity.

Chita Chendia, aged 34, belongs to the Paroja tribal community and resides in Machhara village in Umuri Grama Panchayat, Koraput Block. Her family owns 8.5 acres of land, of which 6.5 acres are dedicated to millet cultivation. Like many other farmers, she initially followed traditional farming methods, including broadcasting, manual weeding, and unscientific fertiliser application. Under these traditional practices, the productivity of finger millet was around 2.5 to 3 quintals per acre. However, the adoption of improved farming practices and quality seeds boosted her productivity to 9.36 quintals per acre. The yield of landraces also increased to over 8 quintals per acre.

Improved Millet Farming

Improved millet farming practices include:

- Seed treatment for better germination and plant health
- Raised bed nursery preparation
- System of Millet Intensification (SMI)
- Line transplantation
- Scientific fertiliser application
- Use of a cycle weeder for weed control
- Seed production technology and post-harvest treatment

Her new skills and improved practices resulted in a significant income boost.

Chita Chendia was eager to adopt improved farming practices to increase millet productivity. In 2018, she received hands-on training in millet seed production. Her new skills and improved practices resulted in a significant income boost. Previously, her income from millet ranged from ₹40,000 to ₹50,000, but after implementing these new techniques, her income has increased to between ₹1,50,000 and ₹2,16,000 annually.

In 2018, she cultivated finger millet on 4 acres of land and produced over 39 quintals of seeds. She earned between ₹4,295 and ₹4,900 per quintal for her seeds, which were sold to Odisha State Seed Corporation. Her skills in producing high-quality seeds garnered much appreciation from fellow farmers. Chita also responded to local demand by producing seeds of small millets and landraces of finger millet.

Chita has since become a recognised master farmer who encourages other farmers, especially women, to adopt improved farming practices and use quality seeds to cultivate landraces of little millet and foxtail millet.

Chita has since become a recognised master farmer who encourages other farmers, especially women, to adopt improved farming practices and use quality seeds to cultivate landraces of little millet and foxtail millet. She actively demonstrates improved methods of farming and seed production applicable to all millet varieties.

By forming a farmer collective (FPO), Chita helped establish a processing centre that reduces the drudgery of women in millet processing. The centre is equipped for grading, cleaning, and packing millet and millet-based products. Chita believes that to encourage greater household consumption of millets, processing should be as efficient and time-saving as possible.

Chita also mobilised 56 farmers to produce quality millet seeds, covering 91 acres for seed production. The growing demand for quality bio-inputs prompted her to set up a bio-input production unit with the support of her husband, which now serves local farmers.

Through her initiative and leadership, Chita has transformed her village and significantly enhanced the livelihoods of fellow farmers. Her efforts to promote improved farming practices, quality seed production, and millet processing have led to higher incomes and better standards of living in the community.

4.9 Community-Managed Bio-Industrial Watershed Experiences in Koraput

Introduction

The Bio-Industrial Watershed approach is based on the principles of the Bio-Village paradigm, which promotes holistic, human-centred growth through the conservation and enhancement of natural resources. It also fosters multiple and diversified on-farm, off-farm, and non-farm employment opportunities. This approach builds on conventional watershed management systems by integrating value addition, market linkages, and appropriate socio-economic and institutional support systems, all managed by the community.

Rain-fed agriculture plays a crucial role in the country's economy, with 78% of the gross sown area falling under this category. The inherent risks of rain-fed agriculture, coupled with climate change and unpredictable rainfall patterns, increase the vulnerability of rural communities. For decades, watershed management has been advocated as a means to manage and augment water and soil resources, thereby improving agricultural productivity. Over time, the approach to watershed management has evolved, incorporating progressive measures. Watershed development can create new opportunities for households to diversify their livelihood strategies and equitably manage common resources for both their livelihood and ecological security. The MSSRF model of sustainable water security follows the principle of converting a conventional watershed into a 'Bio-Industrial Watershed'.

Bio-Industrial Watershed

"The Bio-Industrial Watershed movement involves mobilising the power of partnership among local communities, government departments, financial institutions, and technological experts. I hope that, in the near future, every watershed in our country will become a Bio-Industrial Watershed to ensure work and income security for rural families."

– Prof. M.S. Swaminathan

Bio-Industrial Watershed in Koraput

The district of Koraput is contiguous with the mainland of the Eastern Ghats, with 24% of its land covered by forests and predominantly inhabited by tribal families. Small landholdings, inadequate water sources, and poor soil health contribute to low agricultural productivity. The undulating topography, marked by exposed and eroded lands, gullies, and ravines, necessitates technical interventions for effective rainwater storage. The district is well known for its rich natural resources and vibrant tribal culture.

The region is frequently affected by floods and droughts. Agriculture is the primary occupation, with small and marginal farmers–mostly from tribal communities–forming the majority.

The Bio-Industrial Watershed Programme was initiated in 2007-08 in the Boipariguda block of Koraput district, specifically in the Tolla Watershed area. The watershed comprises the villages of Tolla (Revenue village), Bebaratguda, Kadamguda, Pukaguda, and Maliguda under the Mohuli Panchayat, as well as Bolliguda (Revenue village) under the Chandrapada Panchayat. The predominant tribal communities in the watershed area–Paroja, Bhumia, and Gadaba–constitute 67% of the total population. More than 1,000 households depend on the watershed for their livelihood.

The watershed area is encircled by high hills with scrub forests. Water from the ridge flows at high velocity into the Kukadanala River, a tributary of the Kolab River. The ridge-to-valley difference exceeds 300 metres, leading to rapid runoff, severe soil erosion on unbunded lands, and sand deposition in valley areas.

Despite an average annual rainfall of 1,440 mm, precipitation is erratic, with most rain occurring in July and August, followed by a sudden cessation in mid-September. The region is frequently affected by floods and droughts. Agriculture is the primary occupation, with small and marginal farmers–mostly from tribal communities–forming the majority. Basic amenities such as drinking water, road connectivity, and electricity are severely lacking. Paddy and finger millet (ragi) are the major crops. A few farmers in Maliguda village grow vegetables in their backyards until January, using hill stream water for irrigation. However, most farmers cultivate only one crop during the Kharif season, leaving their lands fallow for the rest of the year due to limited irrigation facilities and low groundwater potential.

Bio-Industrial Watershed Interventions

Soil and Water Conservation

The project has undertaken soil and water conservation measures to provide year-round irrigation, control soil erosion, retain soil moisture, recharge groundwater, and harvest rainwater. Based on the topography and community needs, various conservation activities were identified and implemented with community participation. Contributions from the community were collected and deposited into the watershed committee's bank account for future maintenance.

Major watershed activities carried out in the implementation area

S.No	Watershed activity – engineering measures	Purpose	Benefits
1	Individual Farm ponds	Irrigation and moisture conservation	Farmers to raise crops like paddy, vegetables, groundnut etc
2	Renovation of defunct water harvesting structures	Irrigation and water conservation	Raise more crops
3	Construction of new water harvesting structures	Irrigation and water conservation	Raise more crops
4	Construction of irrigation channels	Irrigation and water conservation	Raise more crops
5	Open wells	Irrigation and water conservation	Raise more crops
6	Contour field bunding	Moisture conservation/ soil conservation	Raise more crops
7	Staggered trenches	Soil and water conservation	Raise more crops
8	Gully Plugging Structures	Prevent erosion	Raise more crops
9	Diversion Weir	Raise the water level	Raise more crops

Community Participation

People's participation was ensured in every activity by demonstrating the benefits of interventions such as soil erosion control, soil health improvement, moisture retention, water conservation, groundwater recharge, and increased irrigation capacity. These measures have facilitated the conversion of wasteland into agricultural land, enabling farmers to grow multiple crops. Since farming is the primary livelihood in the region, watershed development has significantly increased agricultural productivity and income for farming communities.

Impact of Water Harvesting Structures (WHS)

Watershed interventions in the area have enabled farmers to access irrigation for additional crop cycles, thereby enhancing productivity and farm income. The participatory approach of the Bio-Industrial Watershed Programme emphasises efficient water use for crop production, the conversion of wasteland into farmland, soil moisture retention, and diversified livelihood opportunities such as animal husbandry. The experience in Koraput highlights that watershed development is intricately linked to the livelihoods of people under the Bio-Industrial Watershed Programme.

The interventions have successfully increased the area under cultivation and improved the productivity of different crops.

Impact of Water Harvesting Structures (WHS)

Water Harvesting Structure (WHS)	Village/ Hamlet	Increase in Area under cultivation (acres)	Remarks (Increase in Productivity, 2nd Crop, Critical Irrigation, Increase in Income, Convergence/Leverage/ Community Contribution/MGNREGS etc)
Bebartaguda Checkdam	Bebartaguda	26	The structure has helped in increase in avg. income of Rs.1000-3000/acre/farmer. The structure acts as a check dam retaining the runoff and reducing its current, thereby preventing erosion in the command area. The WHS has helped in increasing the cultivation of paddy, millets, horse gram and niger in 26 acres uplands benefitting 16 farmers
Tolla Community Tank -WHS	Tolla	35	Tolla WHS enabled the farmers in the command area to earn an increase in avg. income of Rs.2000-3000/ acre/farmer. Leveraging a Community contribution of Rs.7100 towards its construction, the structure was built with Rs.1,45,000 for structure and laying of pipelines in the downstream to a length of 550 m.
Boliguda WHS	Boliguda	50	New structure completed in July 2011. Bigger structure when compared to other two Tolla and Bebartaguda structures. The structure was constructed generating 974 man days in addition to excavation of some volume of earthwork with earthmoving machineries Total cost: Rs.204692 Project contribution: Rs.186072 Community contribution: Rs.18620
Farmpond-Bio-village	Tolla	3	The farm pond constructed in Bio-village demo-plots is used for demonstration of improved practices. Also used by a group of 5 farmers for vegetable cultivation like tomato, onion in off-season in 3 acres. Pisciculture is also taken up in the pond.
Farmpond-Tolla Wetland	Tolla	2.5	Initiated as a water conservation measure on the valley wetlands (locally called jhola lands) in Tolla to store excess runoff occurring from streams after rainy seasons. Presently used for providing critical irrigation to 5 acres during kharif season and facilitating paddy cultivation in rabi. Also pisciculture is taken up by farmers in the pond.
Farm-pond-Kadamguda	Kadamguda	3	The pond constructed in Kadamguda village for facilitating agriculture activities in off-season for 8 BPL households. Constructed at a cost of Rs.27854 with a project contribution of Rs.27854 with a community support of Rs.3983 towards labour.Presently vegetabels and pisciulture area taken up with water from the pond.
Renovation of Community Tank		7	The existing tank at Tolla was renovated constructing surplus outlet and heightening the bund. Completed in 2011 facilitating irrigation in 7 acres providing an income enhancement of Rs.3000/farmer

Changes in Crop Area and Productivity

Following the watershed interventions, there has been a noticeable increase in the area under cultivation and productivity of key crops such as paddy, millet, and groundnut. These improvements highlight the positive impact of the Bio-Industrial Watershed Programme on the lives and livelihoods of tribal farmers in Koraput.

Major watershed activities carried out in the implementation area

Crop	2007-08				2012-13			
	Kharif		Rabi		Kharif		Rabi	
	Area in Ac	Production in Qtl. /Ac	Area in Ac	Production in Qtl./Ac	Area in Ac	Production in Qtl./Ac	Area in Ac	Production in Qtl./Ac
Paddy	502	11	5	8	482	16	24	18
Ragi	57	1.7			144	4.2	-	-
Groundnut	-	-	25	5.1	-	-	172	6.8
Pulses	-	-	6	1.2	-	-	110	2.4
Maize	7	9			52	18	6	18
Pipla	3	4	26	5.5	26	5.5	-	-

Greening the Watershed Areas

The Bio-Industrial Watershed Programme also focuses on greening landscapes to enhance the ecological resilience of the region. Diverse trees with ecological and economic value have been planted across various landscapes within the watershed areas. The greening initiative aims to increase tree cover, which benefits the environment and provides long-term economic returns to the local community. Increased tree cover reduces soil erosion, retains soil moisture, and helps maintain the water table.

Following the watershed interventions, there has been a noticeable increase in the area under cultivation and productivity of key crops such as paddy, millet, and groundnut

Tree planting in bio-industrial watershed areas

Sl. No	Name of the species	Botanical Name	Number of seedlings planted
1	Radhachuda	*Peltophorum pterocarpum*	3040
2	Simaruba	*Simaruba glauca*	3900
3	Pongamia	*Millettia pinnata*	75
4	Teak	*Tectona grandis*	8220
5	Sisoo	*Dalbergia sissoo*	140
6	Gambhari	*Gmelina arborea*	70
7	Simaruba	*Simarouba glauca*	3100
8	Acacia	*Acacia*	235
9	Krishnachuda	*Caesalpinia pulcherrima*	120
10	Samaneasaman	*Samanea saman*	2800
11	Jatropha	*Jatropha*	2000
12	Aonla	*Emblica officinalis*	2000
13	Eucalyptus	*Eucalyptus*	2000
14	Gliricidia	*Gliricidia*	1500
15	Cassia siamea	*Cassia siamea*	700

The Water Users' Committee has successfully leveraged Rs. 95 lakhs from various sources for soil and moisture conservation works and an additional Rs. 63 lakhs for infrastructure development in the watershed area

Institution Building and Sustainability

Water User Groups have been strengthened to ensure the equitable distribution of water resources. The watershed committee holds regular meetings and manages community contributions for the maintenance of assets created under the project. The Water Users' Committee has successfully leveraged Rs. 95 lakhs from various sources for soil and moisture conservation works and an additional Rs. 63 lakhs for infrastructure development in the watershed area.

Conclusion

The Bio-Industrial Watershed Programme emphasises community participation in planning and implementing interventions to achieve water security. Water is a critical resource for farm households, and their socio-economic development is directly linked to water availability and irrigation infrastructure. An integrated approach has been employed to field-test the Bio-Industrial Watershed model, which incorporates engineering measures, agronomic improvements, institution building, capacity building for local farmers, promotion of diverse livelihood options, and tree planting for environmental sustainability.

These interventions have successfully enhanced soil moisture, improved water availability for irrigation, and increased crop production and productivity. The Bio-Industrial Watershed approach has transformed agricultural conditions in the intervention areas, providing a model of participatory and sustainable watershed development for the hill tracts of Odisha, which can be scaled up to similar ecological regions.

4.10 Gender and Empowerment

The M.S. Swaminathan Research Foundation (MSSRF) has been steadfast in promoting gender equality and women's empowerment through rigorous research and strategic field-level interventions. The organisation ensures that none of its initiatives lead to gender exclusion; instead, its programmes are meticulously designed to foster gender equity and social inclusion. This approach encompasses women and men from tribal, scheduled caste communities, and smallholder farmers across diverse socio-cultural groups. Since its inception, MSSRF has prioritised training its staff on gender and social inclusion, adhering to a pro-poor and pro-women mandate in technology transfer and addressing developmental challenges.

Understanding Gender Issues

Comprehensive Research and Participatory Appraisal

MSSRF has conducted extensive research and participatory appraisals to identify gender-specific challenges, focusing on

- Limited access to food, technology, land, farm inputs, and credit.
- Gender disparities in ownership of resources such as land, farm machinery, and capital.
- Barriers to women's participation in training, awareness programmes, and participatory research.
- Socio-cultural factors impacting women's status, education, and mobility.

Key Gender Issues Identified

Lack of Recognition of Women's Work

Despite significant contributions to agriculture and household livelihoods, women often face discrimination due to prevailing patriarchal norms within tribal communities.

Intra-household Gender Discrimination in Food Intake

In many households, women eat last, often with limited food diversity and nutrition. This practice, influenced by cultural norms and food scarcity, adversely affects women's health.

Time Poverty

Women bear the dual burden of farm work and household responsibilities, including cooking, fetching water, collecting firewood,

Since its inception, MSSRF has prioritised training its staff on gender and social inclusion, adhering to a pro-poor and pro-women mandate in technology transfer and addressing developmental challenges.

and caregiving. This overwhelming workload results in 'time poverty', restricting their opportunities for education, skill development, and rest.

Gender and Mechanisation

Agricultural tasks traditionally undertaken by women, such as transplantation, weeding, and harvesting, remain largely unmechanised. Manual millet processing, for example, is labour-intensive and contributes to physical strain and drudgery for women.

Lower Participation in Agricultural Innovations and Collectives

Women's participation in agricultural cooperatives, farmer producer organisations (FPOs), and farmer federations is significantly lower than men's. Leadership roles in tribal collectives are often dominated by men, limiting women's influence and decision-making power.

Major Activities and Outcomes

Promoting Gender Awareness and Empowerment

MSSRF integrates gender awareness into all field activities. Through participatory research tools, the foundation gains insights into gender roles and relations, enabling the design of effective empowerment initiatives.

Recognition of Women Farmers

Case Studies

- Mrs. Kamala Pujari A Bhumia tribal woman who preserved paddy and millet landraces, provided quality seeds, and educated fellow farmers on conservation. Her work earned her the Padma Shri (2019) and the Equator Initiative Award (2002).
- Mrs. Raimati Ghiuria Known as the 'Millet Queen' of Odisha, Raimati conserves over 30 millet varieties and 72 paddy varieties. She established a community seed bank and supports women farmers through training in improved agricultural practices. Recently, she received an honorary Doctorate in Agriculture from Odisha University of Agriculture and Technology.

Mechanisation to Reduce Drudgery

MSSRF introduced low-cost mechanisation solutions, such as

- Cycle Weeders and Cono Weeders to reduce manual weeding strain.
- Pulveriser/Milling Units These machines cut millet processing time from 80 minutes manually to 5 minutes, significantly reducing time poverty.

Over 10,000 families benefited from 70+ milling units and 200+ custom facility centres providing affordable access to agricultural machinery.

Enhancing Women's Participation in Innovations

MSSRF promotes participatory research in paddy and millet cultivation, ensuring flexible training schedules to increase women's involvement. Women are gaining confidence and benefitting from higher productivity through these innovative practices.

Case Study Transforming Lives through Millet Innovation

- Mrs. Rajni Paraja, a widow from Koraput, adopted improved millet farming practices through MSSRF training. Her yield increased from 2.5 quintals to 10.64 quintals per acre, enhancing her income and enabling her children's education.

Collectives and Farmer Organisations

MSSRF has formed

- 1,458 Self-Help Groups (SHGs) 1,449 of which are women-exclusive, involving over 15,000 women.
- 74 Producer Groups Engaging 4,736 women and 740 men.

Over 10,000 families benefited from 70+ milling units and 200+ custom facility centres providing affordable access to agricultural machinery.

Notable Farmer Producer Organisations (FPOs)

FPO Name	Women Members	Men Members	Total Members
Bamandei Producer Company Ltd	353	0	353
Kolab FPC	62	120	182
Vikash Mahasangh	294	329	623
Bahuda FPC	53	112	165
Kachela Agroproducts	300	0	300

MSSRF's gender-inclusive approach has made significant strides in promoting women's empowerment through

- Livelihood diversification and dietary diversity enhancement.
- Recognition and visibility of women's contributions to agriculture and biodiversity conservation.
- Establishing collectives that build confidence and social networks among women.
- Implementing gender-sensitive training and participatory research.

Through participatory research tools, the foundation gains insights into gender roles and relations, enabling the design of effective empowerment initiatives.

By blending traditional knowledge with modern technologies, MSSRF continues to empower women, transforming them into change agents who contribute meaningfully to their communities' resilience and sustainability.

Case study

Millet Changes the Life of a Tribal Widow in Kundra Block, Koraput District

Mrs. Rajni Paraja, aged 36, resides in Gundariguda village in Phupugaon Grama Panchayat of Kundra Block. She belongs to the Paroja tribal community and depends on agriculture for her livelihood. Earlier, she and her husband cultivated two acres of lowland (shared with her brother-in-law under a joint patta) and one acre of upland (owned by Mrs. Rajni) for millet cultivation.

Tragically, Mrs. Rajni lost her husband in 2017. With two young children to care for, she was forced to assume full responsibility for their upbringing. As she could not work outside due to her childcare responsibilities, she decided to cultivate the land for subsistence. Mrs. Rajni had some prior experience in growing crops like paddy and millet, and she continued paddy cultivation on a sharing basis with her in-laws, receiving paddy only for household consumption in exchange for her labour. She also took up millet cultivation independently.

Initially, Mrs. Rajni faced significant challenges due to limited capital. She lacked funds for ploughing the land, purchasing quality seeds, and accessing other essential inputs. Delays in ploughing, absence of manure application, and inadequate weeding contributed to poor yields. She was only able to harvest 2 to 2.5 quintals of millet per acre, which was insufficient even for household consumption, let alone creating any marketable surplus. Life became increasingly difficult, particularly when her younger son began school, as she had to balance external work with farming while struggling to provide for her children's education.

For Mrs. Rajni, the only viable option was better utilisation of the land she had. She learned about the activities of the M.S. Swaminathan Research Foundation (MSSRF) and the Millet Mission, including the opportunity to register as a farmer willing to sell millet to the Mandi in exchange for a cash incentive of ₹2,000. Initially, she was hesitant to register, as she struggled to produce enough millet for sale. However, MSSRF staff explained the benefits of improved millet farming techniques, which could increase yields to 8-9 quintals per acre. These practices included Line Transplantation (LT), the System of Millet Intensification (SMI), application of farmyard manure, and the use of a cycle weeder. The ₹2,000 incentive proved attractive, and the promise of higher

yields boosted her confidence, prompting her to adopt modern farming methods.

Through attending training sessions, Mrs. Rajni equipped herself with the knowledge needed to implement improved farming practices. In 2022, after adopting these methods, she harvested 8.5 quintals of millet from one acre–a three-fold increase compared to her previous yield. By further refining her practices and learning from her experience, she harvested 10.64 quintals per acre in 2023. Over the two years, she also received an annual ₹2,000 incentive.

Out of her total harvest, Mrs. Rajni sold 4 quintals of millet to the Mandi, keeping the remainder for household consumption. In her village, it is customary to share millet as a gift during weddings and other life-cycle rituals. The increased harvest allowed her to contribute more to community celebrations. Additionally, the income from the Mandi enabled her to pay the advance for the farmer who ploughed her land, ensuring that the work was done on time. In 2022 and 2023, she earned ₹14,308 and ₹15,384, respectively from selling millet to the Mandi.

The adoption of improved millet cultivation practices has transformed Mrs. Rajni's life. It has liberated her from poverty, increased her income, and enhanced her social status. Her children now receive a better quality of education–her elder son attends a boarding school–she is able to provide her children with good clothes, and, most importantly, her family enjoys sufficient food.

Mrs. Rajni's story also highlights the broader challenges faced by women farmers, including limited access to machinery, quality seeds, and knowledge of improved farming practices. A targeted approach focusing on women-headed farm families–by facilitating access to machines, knowledge, and credit or incentives to cover cultivation costs–can empower women farmers like Mrs. Rajni, helping them regain control of their lives and livelihoods.

For Mrs. Rajni, the only viable option was better utilisation of the land she had. She learned about the activities of the M.S. Swaminathan Research Foundation (MSSRF) and the Millet Mission, including the opportunity to register as a farmer willing to sell millet to the Mandi in exchange for a cash incentive of ₹2,000.

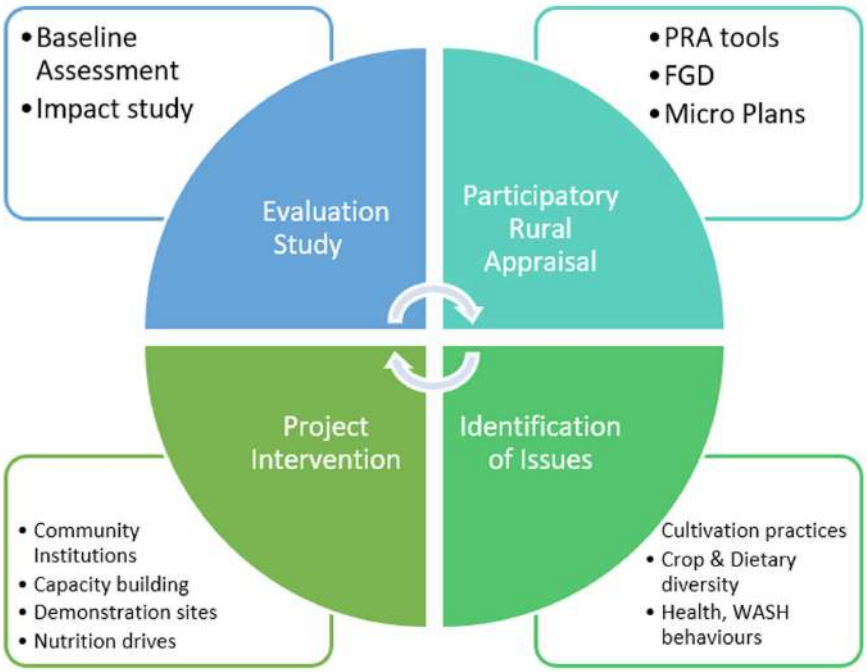
4.11 SAMPOSHAN – A Pathway to Nutritional Security in Koraput, Odisha

Introduction

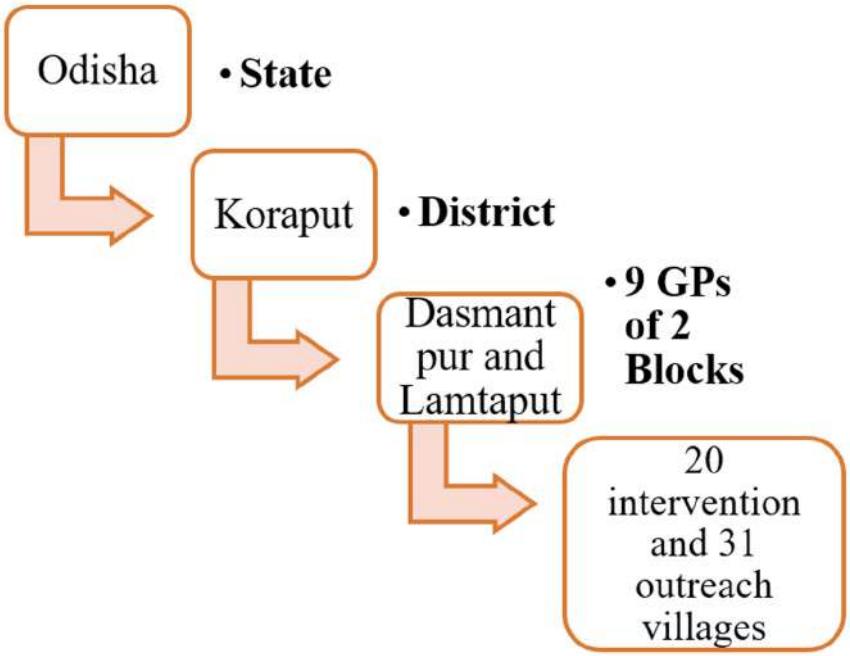
The SAMPOSHAN initiative, aimed at enhancing household dietary diversity and nutritional security among tribal communities in Koraput, Odisha, has made significant strides in its early implementation phase. By integrating nutrition-sensitive agriculture, nutri-garden, and community engagement for nutrition specific interventions, the project has fostered a positive shift in dietary patterns, agricultural practices, and local institutional participation.

Project Implementation Structure

Project has fostered a positive shift in dietary patterns, agricultural practices, and local institutional participation



Intervention Area



So far, 218 households, 39 Anganwadi Centres, and 7 tribal residential schools have developed their own nutrition gardens.

Early Successes and Transformations

Establishing Nutrition Gardens for Household and Community Well-being

One of the key interventions, the establishment of Poshan Vatikas (nutrition gardens), has started yielding results. So far, 218 households, 39 Anganwadi Centres, and 7 tribal residential schools have developed their own nutrition gardens. These gardens provide access to fresh, diverse, and nutritious vegetables and fruits, directly improving dietary diversity at the household level. Additionally, one Self-Help Groups (SHGs) have successfully established Community Poshan Vatika linked to Integrated Child Development Services (ICDS) centres and schools, ensuring a sustainable supply of nutritious food for the Mid-Day Meal Programme

These gardens provide access to fresh, diverse, and nutritious vegetables and fruits, directly improving dietary diversity at the household level.

Sl.	Items	Seeds/plants provided
1	Leafy Vegetables (Cabbage, Cauliflower, Pumpkin, Radish, Bitter gourd)	14.44 kg
2	Other vegetables (Pumkin, Lady finger, Tomato, Brinjal, Cauliflower, Pumpkin, bitter gourd)	15.01 kg
3	Roots & Tubers (Carrot, Radish, Bit)	11.4 kg
4	Climbers (Cow pea, Cucumber, Pumpkin, Bitter Gourd)	14.25 kg
5	Spices (Chilli)	570 gm
6	Fruits (Raw & Ripe) plants: Lemon, Moringa, Papaya, Banana, Pomegranate, Guava, Sapota)	2190 nos.

Advancing Sustainable Farming Practices

Field demonstrations covering 516 acres have introduced improved agricultural techniques for cultivating millets, pulses, oilseeds and vegetables. These demonstrations have not only increased crop

productivity but have also encouraged farmers to adopt nutrition-sensitive farming practices. Furthermore, 248 units of enriched Farm Yard Manure (FYM) and organic formulations have been made available to farming communities, reducing dependence on chemical fertilizers and promoting soil health. To be more specific:

- 20 Farmers Committees formed
- In total 875 total farmers have been supported - 515 nos. in Kharif season, 196 nos. in Rabi season, 164 in summer season
- 1245 households capacitated on improved methods of cultivation and techniques
- 262 farmers mobilized for Line Transplantation of Millets and Paddy cultivation
- 127. 75 acres of land covered under inter-cropping with Cereals, pulses and oilseeds
- Crop-Cutting Experiment of Paddy & Millet.

Sl	Particulars	Methods	Total	Paddy	All Millet
1	No. of farmers having Nutri Sensitive Agriculture demonstration sites under different methods (in Nos.)	LT	262	69	193
		SRI/SMI	27	9	18
		TT	177	70	107
		BC	165	46	119
		Total	631	194	437
2	Crop-cutting Experiment completed and highest yield per acre (fresh grain)	Methods		Paddy	All Millet
		LT		22 qtl.	14.35 qtl.
		TT		18.5 qtl.	9.8 qtl.
		Broadcasting		11 qtl.	7 qtl.
3	Crop-cutting Experiment completed and highest yield per acre (dry grain)	Methods		Paddy	All Millet
		LT		13.26 qtl.	7 qtl.
		TT		10.82 qtl.	4.39 qtl.
		Broadcasting		10.12 qtl.	5.1 qtl.
4	No. of farmers (Kharif and Rabi) with type of Cropping methods (in No.)	Variable	Total	Solo	Inter
		Farmers	711	487	224
		Acres	373.25	245.5	127.75

Enhancing Livelihoods through Mushroom Cultivation

To diversify income sources and improve nutritional intake, 20 SHGs have been trained and supported in setting up mushroom cultivation units. Mushroom cultivation has gained traction as a viable micro-enterprise, with women-led SHGs playing a crucial role in producing and marketing mushrooms locally. The economic benefits, coupled with the nutritional value of mushrooms, have motivated more community members to explore this alternative livelihood opportunity. In total 241

members of 241 families successfully raised 948 oyster mushroom beds. Per bed they are growing 2 to 2.5 kg mushroom and after own consumption selling remaining at Rs. 140/- to Rs. 160/- per kg in the nearest local market. Per SHG the average profit is Rs. 5,000 to 7,000/ month.

Capacity Building and Skill Development

Through targeted training sessions and inter and intra district exposure visits, 1245 families have been equipped with knowledge and skills in nutrition-sensitive agriculture and the establishment of nutrition gardens. Additionally, 40 youths (21 female and 19 male) have been trained as Poshan Sathis, responsible for disseminating nutrition literacy and supporting farming households. Their engagement has strengthened community ownership and sustained awareness campaigns. 50 Anganwadi workers and 10 Tribal Residential school teachers trained on Nutrition Garden. 356 persons (AWW, ASHA, SHG, PRI, PW, LM, AG, mother of 7-month to 5 yr. old children) trained on low-cost nutritious recipe demonstration.

Strengthening Institutional Convergence and Policy Integration

Multi-stakeholder collaboration has been a driving force behind SAMPOSHAN's success. District-level stakeholder meetings chaired by the District Collector and block-level convergence meetings led by Block Development Officers have facilitated coordination between government departments, NGOs, and local communities. Moreover, the inclusion of nutrition-focused components in Gram Panchayat Development Plans under the People's Plan Campaign has laid the foundation for long-term sustainability.

Convergence with Line departments:

- District level stakeholders meeting presided by the District Collector, Koraput
- 2 Block level convergence meetings presided by respective Block Development Officers
- Celebration of Poshan Mah through campaigns and community events involving frontline workers and villagers. The events at the community level are 18 nos. AWC level-14 nos. school level – 7 nos. In total 39 events were organized.
- Training to Anganwadi Workers, School Teachers on Development of Nutrition Garden

1245 families have been equipped with knowledge and skills in nutrition-sensitive agriculture and the establishment of nutrition gardens

Interventions in Convergence with allied departments

- Training to Women Self-Help Groups of Mission Shakti on Mushroom cultivation
- Special Nutrition Campaigns for Women, Children and Adolescent girls with 6 allied departments
- One Model GPDP (Gram Panchayat Development Plan) prepared in Guneipada Gram Panchayat of Lamtaput block through PRA tools in convergence with PRI as per MoRD guideline.

Fostering Nutrition Literacy and Behavioural Change

With nutrition literacy promoted across 1245 households in 20 operational villages, there has been a noticeable shift in dietary habits. Awareness campaigns, counselling sessions, and community meetings have emphasized the importance of a balanced diet, leading to improved food choices and meal planning at the household level. Training of the Trainers (Poshan Sathis/ Staff) and Community level trainings on:

- Nutrition Sensitive Agriculture and Scientific methods of Kharif & Rabi Cultivation
- Nutrition Literacy through Campaigns, community meetings, counselling
- Enriched Farm Yard Manure, Organic formulations and Bio-input usage
- Nutrition Garden at Household, AWC and Schools
- Mushroom Cultivation with Women SHGs
- 50 Anganwadi workers and 10 TR school teachers trained on Nutrition Garden. 356 persons (AWW, ASHA, SHG, PRI, PW, LM, AG, mother of 7-month to 5 yr. old children) trained on low-cost nutritious recipe demonstration.
- Celebration of Poshan Mah through campaigns and community events involving frontline workers and villagers. The events at the community level are 18 nos. AWC level-14 nos. school level – 7 nos. In total 39 events were organized.

Challenges and Lessons Learned

While significant progress has been made, certain challenges have emerged. These include the need for continuous technical support for farmers, infrastructural limitations in some tribal hamlets, and cultural hesitancies in adopting new cropping and dietary practices. However, adaptive strategies such as community-led knowledge-sharing sessions and additional capacity-building initiatives through Poshan Sathis have helped in handling these challenges to some extent. Besides this, infertile land, hilly terrain, high use of chemical fertilizers, pesticides and behaviour towards health, nutrition, sanitation and hygiene practices are still a big challenge to work on.

Conclusion: A Promising Path Ahead

Initiative SAMPOSHAN indicate a promising trajectory towards enhanced nutritional security and sustainable livelihoods for tribal communities in Koraput. With continued efforts in capacity building, community participation, behaviour change and institutional convergence, the project is set to create long-lasting impacts, ensuring that improved nutrition and diversified diets become an integral part of tribal life in Odisha.

4.12 New Initiative for enhancing Community Health Resilience

Sustainable Community-Led Interventions for Tribal Health Resilience in Koraput District, Odisha

Introduction

In line with India's commitment to the Sustainable Development Goals (SDGs) set in 2015, ensuring health and well-being remains a priority. Particularly in tribal areas, challenges such as limited healthcare access, poor transportation infrastructure, and cultural beliefs impact health outcomes. Recognising these hurdles, a community-led initiative was introduced in two blocks of Koraput district, Odisha, to improve healthcare access, nutrition, and sanitation through a sustainable, community-centred model.

Context and Need for Intervention

Koraput district, a predominantly tribal region, is characterised by rugged terrain and limited access to essential health services. Despite government health facilities, poor health-seeking behaviour, reliance on traditional healers, and logistical challenges persist. The National Family Health Survey (NFHS-5) highlighted high prevalence rates of anaemia, diarrhoeal diseases, and infectious outbreaks such as anthrax and leptospirosis, underscoring the need for urgent, sustainable interventions.

Objectives and Approach

The initiative aimed to

- Assess health status, behaviour, and service delivery gaps.
- Empower frontline workers, traditional healers, and community health champions to address malnutrition, anaemia, and infectious diseases.
- Strengthen networks between the community and government health services.
- Enhance disease surveillance and community-based response mechanisms.

The project adopted a socio-ecological model encompassing five levels: individual, interpersonal, institutional, community, and public policy. It sought to instil behavioural changes while reinforcing systemic improvements.

Particularly in tribal areas, challenges such as limited healthcare access, poor transportation infrastructure, and cultural beliefs impact health outcomes.

A community-based disease tracking system was established in collaboration with health workers and Panchayati Raj Institutions (PRIs).

Intervention Strategies

Community Health Champions

Selected from within the tribal communities, trained Community Health Champions (CHCs) play a pivotal role in facilitating health awareness, tracking malnutrition cases, and ensuring early disease detection. They act as a bridge between the community and formal healthcare providers.

Strengthening Local Healthcare Infrastructure

While Dasmantapur and Lamtaput blocks had Community Health Centres (CHCs), many villages lacked proper road connectivity, limiting access to these facilities. The project advocated for mobile health services and decentralised health camps to address this gap.

Nutrition and Hygiene Awareness

Through Self-Help Groups (SHGs), Anganwadi workers, and Village Health Committees, tailored nutrition programs were implemented to combat child stunting and maternal anaemia. Hygiene and sanitation campaigns addressed waterborne diseases by promoting safe water practices and toilet construction.

Disease Surveillance and Outbreak Management

A community-based disease tracking system was established in collaboration with health workers and Panchayati Raj Institutions (PRIs). This enabled real-time data collection, leading to prompt responses to disease outbreaks.

Key Interventions

Village meeting and selection of Gaggad Sathis

A total of 314 villages were selected across two blocks for the project. Community Health Champions (Gaggad Sathi), were selected in a participatory manner in consultation with the community. Generally, one Gaggad Sathi is selected per village. However, in villages with a high number of households, a larger population of pregnant women and children under five years of age, and more than one Anganwadi Center (AWC), multiple Gaggad Sathis were selected.

Progress

- 294 out of 314 village meetings have been conducted (93.6%).
- 304 Gaggad Sathis have been selected (96.8% of targeted villages).

Gaggad Sathi Orientation and Training

Residential training sessions were conducted over three days, covering key topics related to the identification of high-risk pregnant/mothers and malnourished children (SAM and MAM). Each Gaggad Sathi was provided with a tracking register to monitor high-risk pregnancies and malnourished children in their respective villages. They were also trained to collaborate with frontline workers such as ASHA, ANM, and Anganwadi workers.

Once trained, the field staff provided handholding support to Gaggad Sathis in the community, assisting them in measuring height and weight (anthropometric measurements), conducting home visits for pregnant and lactating mothers, and attending Routine Immunization (RI) and Village Health and Nutrition Day (VHND) sessions.

Progress

- 266 out of 304 Gaggad Sathis have been trained (87.5%).
- Monthly refresher meetings are conducted to update the knowledge of Gaggad Sathis and address field challenges they face.

The structured training and continuous capacity-building efforts have significantly improved the role of Gaggad Sathis in their communities, enhancing maternal and child health tracking and intervention efforts.

Orientation of Frontline Workers/staff

To enhance and strengthen primary healthcare, the project aims to build the capacity of frontline workers, particularly ASHA, ANM, and Anganwadi didis. The orientation training covered fundamental MCH concepts, including:

- Anaemia and iron-folic acid (IFA) supplementation
- Nutrition during pregnancy and complementary feeding practices
- Home-Based Newborn Care (HBNC) and Home-Based Young Child Care (HBYC)

Expected Outcomes and Impact

- Increased Healthcare Utilisation: A rise in institutional deliveries and antenatal care uptake was observed, demonstrating improved trust in formal healthcare services.
- Enhanced Disease Response: Community-driven surveillance led to quicker interventions during diarrhoeal and malaria outbreaks.
- Improved Nutritional Awareness: More families adopted recommended dietary practices, reducing cases of undernutrition in children under five.
- Better Sanitation Practices: Households constructed latrines and adopted safe drinking water practices, leading to reduced incidences of waterborne diseases.

Challenges and risks

- Geographical Barriers: Persistent road and network issues continue to hinder healthcare accessibility.
- Cultural Beliefs: Some tribal communities remain hesitant to adopt modern healthcare practices.
- Sustainability Concerns: Ensuring long-term government support and community ownership remains crucial.

Next Steps and Sustainability Plan

Going forward, the project will focus on policy advocacy to institutionalise community health champions within government health schemes. Strengthening partnerships with local governance structures and NGOs will enhance resource mobilisation for long-term sustainability.

Households constructed latrines and adopted safe drinking water practices, leading to reduced incidences of waterborne diseases.

4.13 CBOs / FPOs Nurtured by Tribal Agrobiodiversity Centre

Private seed companies and public sector agricultural extension agencies play a crucial role in this system, applying advanced technologies to produce high-yielding seeds

PANCHABATI GRAMA UNNAYANA SAMITI

PANCHABATI GRAMA UNNAYANA SAMITI was registered under society registration act – XXI of 1860 on 19th February 2003. The Samiti is working in 16 villages covering 5000 population of 1086 households. 78% of the population is tribal. Regular village meetings are conducted to mobilize people towards local institution build up. The society was initiated in 2003 the main aim of the organization for conservation and sustainable use of local bio-resource for better livelihood in 16 villages.

PGUS and related to livelihood like vegetable cultivation, fish farming established a traditional seed garden (Conservation garden) pulses 06 varieties, paddy 136 varieties and millets 12 varieties conserved through diversity block. In the shake of fire wood massive plantation work done through linkages with forest department.

Livelihood support

The samiti working from last 15 years for betterment of the livelihood in this area. In this regard the Samiti support activities like vegetable cultivation, seed production, Paddy, Millte and local Maiz cultivation etc through seed bank activities. Time to time seed treatment training from village to village given during the village meeting before planting. Training on mushroom cultivation was provided to 68 beneficiaries from 14 villages.

VIKAS MAHASANGHA

Introduction

2007 MSSRF started the Bio-Industrial Watershed Project in Baipariguda Block. Vikash Moha Sangha is established at Tolla GP of Baiparigud block of Koraput District. The Company is fully operated by man & woman of Tolla, Chandrapada and Bodaput GP of Baipariguda Block. There were 563 members associated in this company. The company was established as a formal farmer producer Company in the year 2009 by the help of the promoting Non-government Origination MSSRF, jeypore. Before that it was working as SHGs. VMAS started the journey with the hand holding of grassroots which helped them a lot of mobilize the Man & woman to explore their potential. It was initiated in 2009 as a of profitable Self-Help Groups referred to as Vikash Moha Sangha. However, further support

to the groups for future plans for additional growth, efforts were created to the business like – Goat rearing, poultry farming, Mushroom Cultivation and Ground nut seed production for profitable Producer Company.

Main Objective

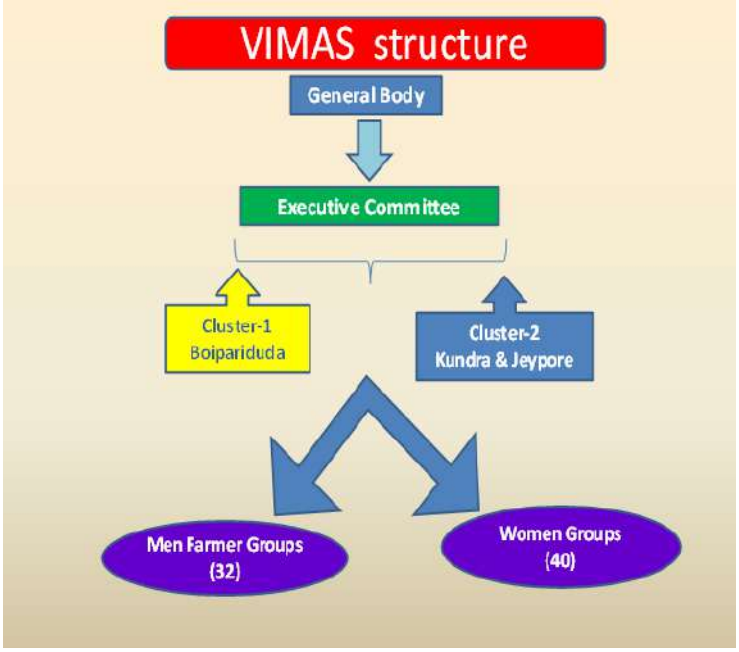
Foundation has been involved in Participatory Research with local communities and farmers, especially in tribal areas, related to conservation and management of biodiversity, agro-biodiversity, eco-technology, ecological restoration, soil and conservation, sustainable agriculture and ICT-led programmes. In the Participatory Research, MSSRF has for a long time now, in response to both the scope and the need, been setting up local community- based institutions, with the objectives of

- Creating local platforms to ensure effective community participation with social equity
- Building new capacities and
- Sustaining the results of the development interventions after we exit from project mode by building the social capital.

In this context, the concept of a Grass Root Institution works on the hypothesis that local development within the community can be driven by user group members rather than promoting or facilitating agencies and making people agents of their own change and sustain the changes through building autonomous local institutions

Purpose

To consolidate the Grass Root Institutions with an intention to provide and support assured multi services from seed to market to the community in the region and creation of the apex level organization of the Men and Women Farmer groups into a Federation.



Institutional Frame work

- VIMAS is having both men and women farmer groups.
- Number of members in a group – 10 to 20
- Rs.10/- non-refundable membership fees and Rs.1000/- as share capital.(1 Share) or multiple. Maximum number of shares per member limited to 5 nos
- Cluster level meeting - once in a month.
- Executive Committee meets – once in a quarter.
- The VIMAS operate its finance through Bank Account in IOB & SBI- Boipariguda.

Services

- Input support through micro credit.
- Supply of improved variety seeds on time and at reliable cost.
- To develop village level agri-processing units and storage facility.

VIKAS MAHASANGHA	
Date of Formed	28, June,2011
Area of Operation	Boipariguda
Member	563
Share Capital	Rs.2,17,800
In Bank	Rs. 2,46,776
Turn over	Rs. 2,12,000

- Market linkages for better price for the produce
- Awareness among members and community on education, health and sanitation.
- Awareness and support to off-farm & non-farm livelihood.
- Promotion of location suitable crops and varieties for sustainable farming system.
- Develop Linkages with institutions for capacity building on farming and value addition.

KOLAB FARMERS PRODUCER COMPANY LIMITED

Registered office of the Company will be situated in the State of Odisha

About KFPCL Kolab Farmers Producer Company Ltd (KFPCL), is registered under the Companies Act, 2013 (PART IXA of Companies Act 1956). This is a Company Limited by Shares, located in the Baghraguda village, Mastiput Gram Panchayat of Koraput block of Koraput district of Odisha. This FPC was formed in 2018 and became fully functional on 28th June 2019 with all legal compliances. In the Memorandum of Association, 10 farmers (6 female and 4 male) of 9 villages, which are part of 4 Gram Panchayats have subscribed as Board of Directors (BoD). The authorised Share Capital of the company is Rs. 10,00,000/- (Rupees Ten Lakh only) divided into 10,000 equity shares of Rs.100/- each with the power to increase its share capital by such amounts as it thinks expedient by issuing new shares and to divide the shares in the capital for the time being into several classes and to attach thereto respectively such preferential, qualified or special rights, privileges or conditions as may be determined by or in accordance with the regulations of the company. In the first phase, 5 persons became the Directors including 3 female and 2 male farmers. 80% of the members of the FPC are small and marginal farmers

Role/Function of KFPCL

- Preserve the indigenous seeds - Availability of quality seeds (improved variety)
- Access to the seed requirement - Timely supply of quality seed at affordable price
- Reduced dependence on external seed sources - Village based seed committees
- Create self-sustainable seed enterprise - Capacity building learning new technologies
- Create Farming System for Nutrition - Absorption of Millets at household level
- Improve the livelihoods of small-scale millet and pulses growing farmers - Village level employment generation
- Sustainable food, feed, fodder, livestock and livelihood security

Objective of KFPCL

This Company was initiated by tribal men and women farmers to carry on business of production, harvesting, procurement, grading, processing, resource development, packing, marketing and trading of:

1) Agricultural produce, 2) Horticulture, 3) Vegetables, 4) Poultry, 5) Goat-keeping, 6) Beekeeping, 7) All agricultural inputs

In November 2019 the FPC BoD, applied to the Tahasildar, Koraput for land allocation for the construction of Community Seed Godown at Baghraguda. For this, M S Swaminathan Research Foundation provided hand-holding support to the farmers working closely with Agriculture Department of Govt. of Odisha implementing "Alternative Seed System Model" project under Rashtriya Krishi Vikas Yojana (RKVY). Each year the FPC has to submit the KYC of its BoDs for updating and it costs around Rs. 20,000 to Rs. 30,000/-.

KOLAB FARMERS PRODUCER COMPANY LIMITED

- **Date of Registration** 28, June,2019
- **Area of Operation** Koraput block
- **Membership** 182
- **Share Capital** Rs.28,920
- **Corpus Fund** Rs.7,50,000
- **Total** 12,86,292.89
- **In Bank** 7,55,789.89

Year wise Business Transacted Starting from December 2019, Finger Millet seed has been @4300/-per quintal.

Sl No.	Year	Area in Acre	Number of farmers	Seed Procurement in Quintal
1	2018-19	*30*	78	113
2	2019-20	*35*	92	126
3	2020-21	*79*	151	269
4	2021-22	*75*	143	259
5	2022-23	*51*	102	187
6	2023-24	*72*	114	329
	Total	*342*	680	1276

Items	2019-21	2023-24	Increased %
Current Liabilities	28,150	*90,000*	220

BAMANDEI PRODUCER COMPANY LTD (Collaborating with Govt of Odisha under Shree Arnna Jajana)

About Bamandei Producer Company Ltd (BPCL), is registered under the Companies Act, 2013 (PART IXA of Companies Act 1956). This is a Company Limited by Shares, located in theNuaguda village, Lima Gram Panchayat of Koraput block of Koraput district of Odisha. This FPC was formed in 2018 and became fully functional on 28th June 2019 with all legal compliances. In the Memorandum of Association, 10 farmers (10 women) of 64 villages, which are part of16 Gram Panchayats have subscribed as Board of Directors (BoD). The authorised Share Capital of the company is Rs. 10,00,000/- (Rupees Ten Lakh only) divided into 10,000 equity shares of Rs.600/- each with the power to increase its share capital by such amounts as it thinks expedient by issuing new shares and to divide the shares in the capital for the time being into several classes and to attach thereto respectively such preferential, qualified or special rights, privileges or conditions as may be determined by or in

BAMANDEI PRODUCER COMPANY LTD	
• Date of Registration	28, June,2019
• Area ofOperation	Kundra
• Membership	554
• Share Capital	Rs. 2,17,800
• In Bank	Rs. 4,80,776
• Turn over	Rs. 1,00,000

accordance with the regulations of the company. In the first phase, 5 persons became the Directors including 5woman farmers. 80% of the members of the FPC are small and marginal farmers

Role/Function of BPCL

- Preserve the indigenous seeds - Availability of quality seeds (improved variety)
- Access to the seed requirement - Timely supply of quality seed at affordable price
- Create self-sustainable seed enterprise - Capacity building learning new technologies
- Sustainable food, feed, fodder, livestock and livelihood security
- Procurement of ragi in block level.
- Monitoring of millet processing unit

Objective of BPCL

This Company was initiated by tribal men and women farmers to carry on business of production, harvesting, procurement, grading, processing, resource development, packing, marketing and trading of:

1) Agricultural produce, 2) Poultry, 3) Goat-keeping, 4) Bio-input

Chapter 5: Key accolades of the Centre

Equator Initiative Award 2002
For tribal communities' relentless efforts to conserve biodiversity & reduce poverty

Krishi Bisharad Sanman 2003
ICAR Delhi recognises tribal farmers Trilochana Ghiuria & Kamala Pujari for conserving &enhancing 100 paddy landraces in Jeypore tract

Felicitation by Hon'ble CM Odisha
Shri Naveen Patnaik felicitates Kamala Pujari for her leadership in the Equator Initiative Award

Folk Fair Award 2008
Chandrama Mashiha awarded for work towards conservation & sustainable livelihoods with Panchabati Gramya Unnayan Samiti & SHGs

Plant Genome Saviour Community Awards 2007 & 2010
PPVFRA, Govt. of India, awards Panchabati Gramya Unnayan Samiti, recognising outstanding service in conserving, improving and making plant genetic resources available for the development of new plant varieties

Globally Important Agricultural Heritage Systems 2012
United Nations FAO recognises Koraput as first GIAHS in India, from efforts led by MSSRF & tribal communities to ensure biodiversity conservation, food security, & preserving traditional wisdom and cultural diversity

National Water Award 2012
Ministry of Water Resources, Govt of India, award for Bio-Industrial Watershed work in Tolla Watershed Area, Koraput

Agriculture Leadership Award 2013
Conferred on Mitsubishi Corporation of India, to recognise outstanding work towards improving tribal livelihood security in Koraput,collaborating with MSSRF under CSR engagement

Global Water and Food Award 2014
Community-managed Bio-industrial Watershed work won second place for water & food security initiatives in Jeypore

Padma Shri for Kamala Pujari 2019
India's 4th highest civilian award of India reflecting MSSRF's efforts to empower tribal communities on biodiversity conservation & organic farming systems

Chapter 6: Thematic Strategy Plan 2025-2030

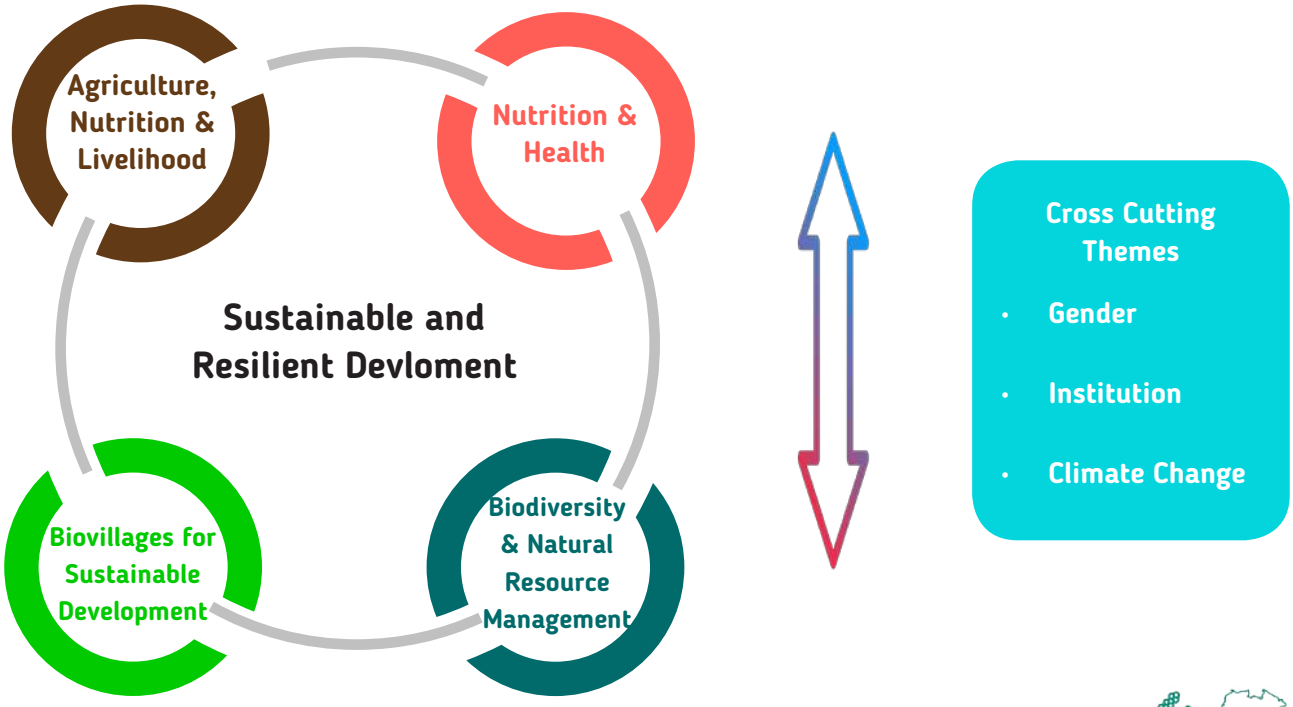
Tribal Agro-Biodiversity Centre, MSSRF Jeypore

The Tribal Agro-biodiversity Centre (TAbC) was established in 1998 in Jeypore, Koraput district, to promote the on-farm conservation of crop genetic resources and strengthen the livelihoods of tribal men and women farmers. Prior to this, in 1994-95, the foundation documented the traditional crop genetic resources and conservation practices of tribal farmers. Subsequently, the centre developed models to operationalise the in-situ conservation of paddy and millet genetics by adopting the 4C approach– Conservation, Cultivation, Consumption, and Commercialisation.

The core activities have focused on strengthening livelihoods and reducing poverty and malnutrition, particularly by improving productivity and diversification to enhance income. Over the past three decades, catalytic interventions have positively impacted more than 1,16,433 households across 2,837 villages in Odisha. Significant models that have contributed to this impact include:

- Establishing community-based seed banks and grain banks as an adaptation strategy to ensure access to seeds and grains.
- Creating an alternative seed system model as a transition from the community seed bank approach.
- Developing sustainable production technologies through co-development and co-creation processes, incorporating backward and forward linkages to enhance adoption rates.
- Promoting soil and water conservation using bio-industrial watershed principles.
- Reducing labour-intensive tasks in production and post-harvest processing by introducing decentralised farm machinery and processing units.
- Demonstrating pathways to reduce malnutrition through Farming Systems for Nutrition linked with nutrition literacy.
- Encouraging diversification and intensification of farming systems to boost production, employment, and income.
- Strengthening the Nutrition Garden approach to improve dietary diversity and nutritional awareness.
- Implementing gender-responsive approaches in the co-creation and co-development of technologies and practices.
- Fostering collective action and institutionalising interventions through farmers' collectives and associations.

Building on this progress, TAbC aims to focus on key themes over the next five years to address contemporary socio-economic and environmental challenges, as well as emerging climate risks. The Strategic Plan 2025-2030 aligns with the broader institutional strategy, targeting an outreach of 2.5 lakh people in the state over next 5 years (Fig).



Strategic Themes

The strategy encompasses four main themes–agro-biodiversity, agriculture, nutrition, health and holistic village development at the landscape level–while considering climate risks and vulnerabilities. These broad themes will be further broken down into relevant sub-themes to address local, national, and global priorities and commitments, ensuring sustainable and resilient development.

1. BIODIVERSITY AND NATURAL RESOURCE MANAGEMENT

- Biodiversity Conservation and Livelihoods
- Ecosystem Restoration
- Safeguarding Heritage Sites
- Landscape Management
- Biodiversity Policies and Literacy

Biodiversity Conservation and Livelihoods: Agro-biodiversity linking Food and nutrition, medicinal plants linking local health systems and livelihoods

Ecosystem Restoration: Conservation and restoration of Rare, Endangered, and Threatened (RET) species; Sustainable harvesting and use of NUS and minor forest produce

Safeguarding Heritage Sites: Recognising and protecting Globally Important Agricultural Heritage Systems (GIAHS)- Koraput and Biodiversity Heritage Sites (BHS) such as Gupteswar and Deomali.

Landscape Management: Integrated soil, water conservation and management measures at the landscape level

Biodiversity Policies and Literacy: Creating awareness, facilitating action on legal provisions related to Conservation, Sustainable use and access and benefit-sharing, and promoting farmers' rights.

2. AGRICULTURE, NUTRITION AND LIVELIHOODS

- Agroecology
- Farmer-Managed Seed Systems
- Agroforestry and Nutrition Gardens
- Farmer Collectives, Markets, and Governance
- **Youth, Innovation, and Entrepreneurship**

Agroecology: Integrating farming systems (Animal Husbandry, Pisciculture and Forestry) for nutrition, livelihoods, and climate resilience models

Farmer-Managed Seed Systems: Alternative seed systems, building the network of community seed banks and linking with farmers rights

Agroforestry and Nutrition Gardens: Locale-specific models of agroforestry at landscape level integrating native trees, promoting wild uncultivated food and associated knowledge systems

Farmer Collectives, Markets, and Governance: Strengthening a network of Farmer Producer Organizations, farmer's markets and value chain development

Youth, Innovation, and Entrepreneurship: Promoting Farmer Field School, digital tools, local innovations and rural start-ups

3. NUTRITION AND HEALTH

Nutrition Literacy and Community Health

Water, Sanitation, and Hygiene

Preventive and Promotive Health

Adolescent, Maternal and Child Health

Nutrition Literacy and Community Health: Context specific diet related issues, local food based approach for nutrition and health, and access to information about healthy diets

Water, Sanitation, and Hygiene: Awareness creation and Convergence for access to quality services

Preventive and Promotive Health: Create access to entitlements and provisioning of support through behaviour change

Adolescent, Maternal and Child Health: Strengthening knowledge, information and communication systems to improve access on antenatal and postnatal care, breastfeeding, micronutrient supplementation and complementary nutrition and feeding.

4. BIOVILLAGES FOR SUSTAINABLE DEVELOPMENT

Science based village development planning and implementation aligning with Gram Panchayat Development Planning and One Health approach at the village and ecosystem levels.

5. CROSS-CUTTING THEMES

Gender, Social Inclusion and Climate Change

The centre aims to implement key provisions of the **National Biodiversity Act and Plant Variety Protection and Farmers' Rights Act** to enhance crop genetic resources management. Given that the Koraput region is a secondary centre of origin for rice and other crops, this strategy will reinforce its recognition as a **GIAHS and BHS adopting ecosystem** based planning and development. Here the approach of localizing actions for translating **State Action Plan on Climate Change** will be given focus.

Besides, the initiatives will address to promote the **One Health approach linking Agro-ecological and Community Health dimensions**. The integrated approach will focus on institutionalising these efforts through model development and strengthening multi-stakeholder partnerships and convergence for large-scale implementation. Thus, the TAbC aspires to evolve as a centre to operationalise the **stakeholder engagement model of Science, Policy and Practice** framework.

Chapter 7: Donors

We are immensely thankful to our donors

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Investing in rural people

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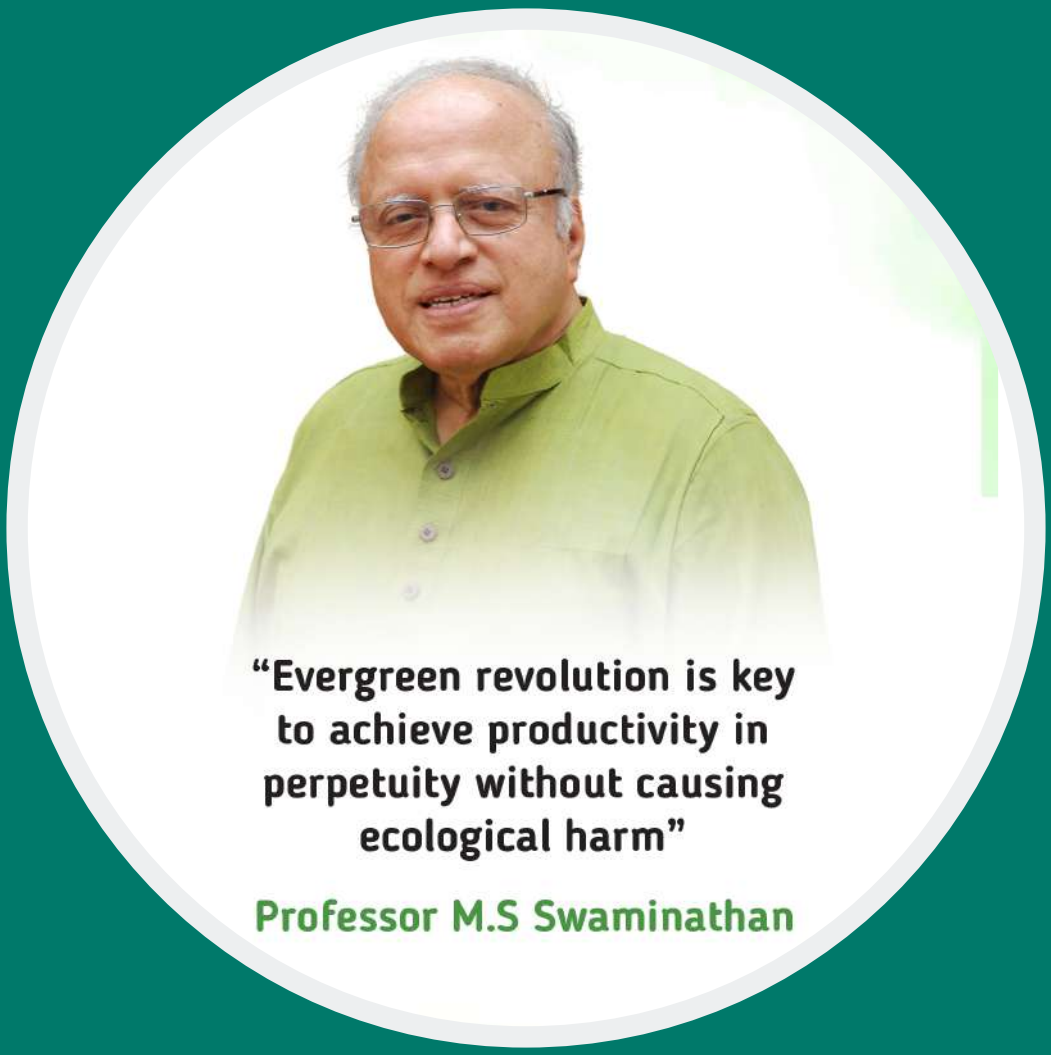
We are indebted to our collaborators, knowledge partners, stakeholders from communities

Glimpses of 30 Years of MSSRF Work in Odisha

Glimpses of 30 Years of MSSRF work in Odisha

MSS@100
7 August 2025

30 YEARS mssrf TAbC



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